METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD & COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

VOL. 30 NEW YORK, DECEMBER, 1932 No. 12

Non-Ferrous Metals in the Aircraft Industry

By FRANCIS A. WESTBROOK

Mechanical Engineer

Aluminum Used in Largest Quantity. Magnesium Growing in Importance. Copper, Zinc, Tin, Nickel and Platinum Used in a Wide Variety of Parts*

IN the construction of aircraft aluminum is by far the most important non-ferrous metal used at present from the standpoint of quantity, but there are prospects that magnesium will soon be aggressively competing with it. Of course the other usual non-ferrous metals also play important roles but the quantities employed are small. However, inasmuch as lightness is the prime consideration in the selection of metals for airship construction the developments in the use of aluminum have been carried to a high degree and now magnesium, which is still lighter, is coming to the fore and is of great interest in this connection.

Aluminum

Aluminum is used for aircraft engines for the same reason that it is employed in the engines of motorcars. That is, lightness of reciprocating parts reduces vibrations and stresses, and reduction of weight in general is a great asset, for obvious reasons even more so with airships than automobiles. For instance in a paper read before the S.A.E. in 1928, R. S. Archer of the Research Department of the Aluminum Company of America mentions an aluminum alloy cylinder head weighing only 64 lbs., a water jacket weighing 42 lbs. and brake drum assemblies weighing 15 lbs.

By using aluminum alloys for the above parts, as well as for the crankcase, pistons, gear housings, oil pans, etc., it is now practicable to make water cooled engines weighing about 1.5 lbs. per hp. including the weight of the cooling system. For racing planes this weight has actually been reduced to .85 lbs. per hp. by taking measures too expensive for ordinary commercial practice. This compares with 12 lbs. per hp. for automobile engines.

Air-cooled aircraft engines have crankcases, consisting of the main section, nose section, rear section and diffuser section, made of castings or forgings of strong aluminum alloys. Cylinder heads, rocker boxes, pistons, connecting rods, link rods and other miscellaneous parts of the radial engines are of aluminum alloys. About 50 per cent of the weight of these engines is aluminum and their weight per hp. is about the same as for water cooled engines.

Propellers are also frequently made of aluminum alloy and, in addition to their lightness, have the advantage of bending without breaking when hitting an obstruction. Such bends can usually be temporarily repaired by an aviator sufficiently to enable him to reach some airdrome.

Aluminum alloy is used for wing construction to a great extent and is rapidly increasing. On account of its strength, light weight and ready workability it can be employed without trouble for practically all of the shapes employed for the modern machines. Sheet, tubes and bars are the shapes generally used. The following table, based on data supplied by the Boeing Airplane Company

*Other articles by Mr. Westbrook on the subject of Metals in Transportation were published in our issues of January, February, April and October, 1932.

and published in "Aluminum In Aircraft" by the Aluminum Company of America, gives a very good idea of the saving in weight realized by aluminum wing construction.

Comparison of Material Weights

TYPE OF CONSTRUCTION	MEMBER	AREA SQ. FT.	WEIGHT POUNDS	WEIGHT POUNDS PER SQUARE FOOT
Wood and Fabric		14.8	24.6	1.66
17 ST Alloy	Aileron	17.4	18.3	1.05
Wood and Fabric	Stabilizer	19.8	31.9	1.61
17 ST Alloy		23.7	26.7	1.12
Steel Tube and Fabric		9.8	16.0	1.63
17 ST Alloy	Elevator	13.7	18.3	1.33

The construction of the fuselage, hull and pontoons may be made of aluminum alloys. For instance a fuselage with a frame made of aluminum alloy and covered with fabric was found to be 20 per cent lighter in weight than one constructed of steel tubing. Another interesting instance of aluminum alloy construction is that of a pontoon formerly made of wood. The actual saving in weight of material was not great but the wood has a way of absorbing water which frequently is sufficient to be an important factor which, of course, does not occur with metal construction.

Other airplane parts made of aluminum alloys are wheels, gasoline tanks, tubes for fuel, water and oil feed lines, door and window frames, trimmings and fittings of all kinds, as well as the cowl of the engine. Still other parts are spring casings, brake shoes, control mechanism, etc. In addition to this much of the furniture used in passenger planes is of aluminum.

The following table taken from the same publication of the Aluminum Company of America, and based on data supplied by the Douglas Aircraft Company, gives weights of identical parts of steel and aluminum alloy which show the savings in weight very strikingly.

With dirigibles aluminum is used in much the same way although of course the structural part is much more elaborate than with planes. The Akron has in addition some 6,500,000 rivets made of decralumin, an aluminum stove, kitchen utensils, bathroom fixtures and other accessories. There is a condensing apparatus to extract water from the exhaust gases from the engines made of aluminum tubes, and telephone and electrical power conductors are also made of aluminum. In fact much of the electrical equipment is made of this metal to save weight.

Comparison of Material Weights

PART	WEIGHT IN POUNDS 195-4 ALLOY	STEEL
Bracket—Front Fin Beam	1.21	3.10
Bracket—Wing Tip Float	0.156	0.468
Guide—Hoist Sling	0.14	0.30
Strut End	0.55	0.61
Strut End	0.55	0.77

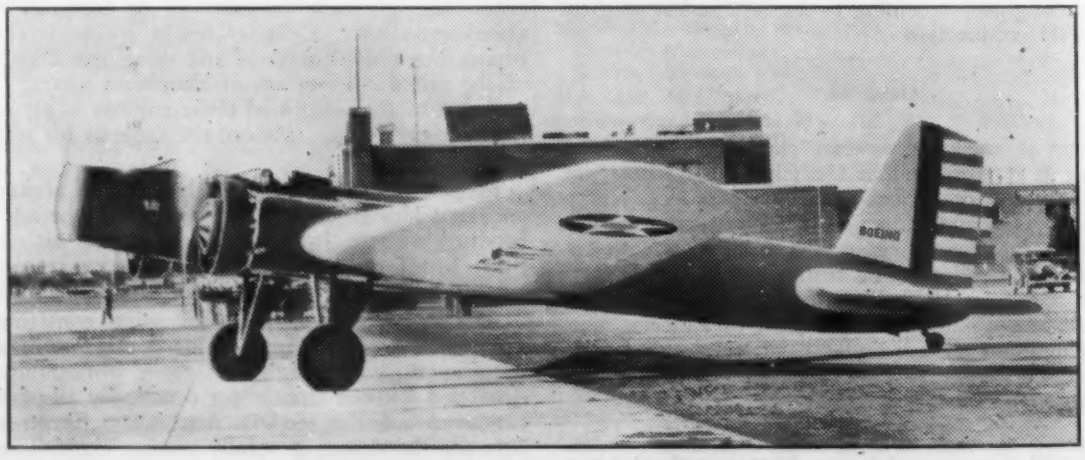
Magnesium

Magnesium is the most recent of structural engineering metals to enter the field of modern industry. It is only within the last year or two that methods for producing it on a commercial basis have been perfected and that alloys have been developed suitable for the use of the engineer. On account of the newness of these it may not be amiss to outline a few of their properties which are probably not yet generally known. It will help to an understanding of why they are so important to the aircraft industry.

In a paper presented before the meeting of the American Institute of Chemical Engineers, Detroit, Mich., June 4th to 6th, 1930, Dr. John A. Gann, Metallurgist of the Dow Chemical Company, said "The properties that fit these magnesium alloys for aircraft use are extreme lightness, high strength and good fatigue endurance." They may also be fabricated and welded and they respond to heat treatment. The following two tables taken from Dr. Gann's paper, above referred to, show the physical properties of these alloys (called Dowmetal) in comparison with the other metals. The first table makes the comparison on the basis of specimens of equal dimensions and the second table on the basis of equal weights.

Equal Volume Relations

Name	Relative Weight	Tensile Strength Lbs. sq. in.	Elongation %	Fatigue Endurance Limit in Bending Lbs. sq. in.
Mild steel	4.4	60,000	30.0	30,000
Alloy steel	4.4	100,000	20.0	50,000
Aluminum alloy, cast, heat-treated	1.6	33,000	8.0	....
Duralumin	1.6	60,000	20.0	15,000
Dowmetal, cast, heat-treated	1.0	33,000	10.0	9,000
Dowmetal, wrought, heat-treated	1.0	42,000	12.0	14,000



All-Metal, Low-Wing, Twin-Engined Boeing Bomber.

Equal Weight Relations

Name	Relative Weight	Tensile Strength Lbs. sq. in.	Fatigue Endurance Limit in Bending Lbs. sq. in.
Mild Steel	4.4	60,000	30,000
Alloy steel	4.4	100,000	50,000
Aluminum alloy, cast, heat-treated	4.4	91,000	.....
Duralumin	4.4	172,000	70,000
Dowmetal, cast, heat-treated	4.4	145,000	80,000
Dowmetal, wrought	4.4	185,000	125,000

From this it will be seen that the magnesium alloys weigh about one-third less than aluminum alloys, volume for volume, and that weight for weight the magnesium alloys are much the strongest of any.

The composition of the most usual alloys and their uses is given in the following table taken from a publication of the Dow Chemical Company.

COMPOSITIONS AND USES OF MAGNESIUM ALLOYS FOR AIRCRAFT

ALLOY	NOMINAL COMPOSITION—PER CENT MAGNESIUM	ALUMINUM	MANGANESE	CADMIUM	COPPER	USES
Dowmetal F	95.7	4.0	0.3	...	...	Forging, rolling, and extrusion where maximum ductility is required.
Dowmetal E	93.7	6.0	0.3	...	...	Castings requiring good strength without heat treatment. Mechanically worked parts requiring both strength and ductility.
Dowmetal A	91.8	8.0	0.2	...	...	High strength heat-treated castings. Mechanically worked parts requiring maximum strength.
Dowmetal T	91.8	2.0	0.2	2.0	4.0	Pistons and other parts requiring maximum thermal properties.
Dowmetal M	98.5	...	1.5	...	...	Maximum corrosion resistance. Primarily for cast and fabricated parts not subjected to maximum stresses.

Magnesium alloys are now being used, among other things, for engine parts such as crankcases, housings, fuel tanks, furniture, trimmings, wheels, struts, ribs and sheet covering. This applies to both planes and dirigibles. Both the Graf Zeppelin and the Akron have many magnesium alloy parts. In fact the above list of parts made of magnesium alloys very closely follows that of aluminum parts. Even propellers are now made of magnesium alloy forgings and have given excellent results. Those of magnesium weigh 52 lbs. which compared to similar ones of aluminum weighing 78 lbs.

To date the use of the magnesium alloys has been much the greatest in Germany and Italy, but at the present time it is increasing very rapidly in this country and the recent remarkable reduction in the cost of this metal has given it a great impetus.

Copper

It has been estimated by the Copper & Brass Research Association that some 1,500,000 lbs. of copper was consumed by airplane manufacturers in 1929, exclusive of motors and accessories. Some of the places where copper is consumed are in the form of tubing for fuel and oil, for the circulating system, with water cooled motors in brass and bronze with the other non-ferrous metals for bearings. Copper wire is used to keep bolts and nuts from working loose from vibration.

One airplane manufacturer mentioned by the Copper & Brass Association installs 52 feet of copper tubing, plus bronze castings in the landing gear. Another concern uses 73 feet of copper tubing, 146 feet of copper cable for the ignition system and in addition 20 feet of brass tubing and wire cloth, brass and bronze for various castings and small parts.

Dirigibles also employ copper in various forms very much along the same lines as do planes. That is the fuel lines are of bronze where near the engines and in other places they are of copper. Brass bars are used as well, and of course copper enters into the bearing metals.

Nickel

Nickel enters into aircraft construction in many ways. Rustless steels containing 13 to 18 per cent chromium and 7.8 to 13 per cent nickel are used in strip and sheet form. On the Akron the exhaust manifolds are made of rustless steel and the outrigger fittings, because of the need of extra strength, are of nickel steel. Chrome-molybdenum steel is another alloy used on this dirigible. The nose ring is a nickel steel forging.

Nickel and nickel iron and steel alloys enter into the engine parts and wood propeller blades are sometimes sheathed with monel metal to protect them against erosion.

Variety of Metals Used

At least 14 elements, comprising more than two-score alloys, are utilized in filling the metal requirements of the airplane of today, according to an article in Western Flying on the materials of aviation by H. S. Lewis. The elements are aluminum, magnesium, nickel, chromium, molybdenum, platinum, iron, manganese, tungsten, cobalt, silicon, copper and zinc (brass) and tin (in bronze).

In an average radial air-cooled engine, he points out, the weight is made up of about 45 per cent aluminum alloys, 52 per cent steel, and the remaining 3 per cent brass and bronze.

Aluminum alloys, are used principally for crank cases, pistons, cylinder heads, pump and supercharger impeller parts, intake pipes, housings and cowling. The designing engineer now has some 12 or 13 standard aluminum and magnesium alloys from which to choose, according to their forging or casting properties, heat conductivity, strength and specific gravity. The small amounts of bronze and other copper alloys which enter into engine construction are used mostly for bearings and miscellaneous fittings. A special nickel-bronze is often used for bushings and valve seats, and here again we have about a dozen brass and bronze compositions that may be specified.

Spark plug electrodes are 4 per cent manganese and 96 per cent nickel. The firing points in the distributor are of platinum.

Nickel in Foundry Brasses and Bronzes

Nickel Was Added Advantageously In Varying Amounts To Six Different Mixtures. Some of the Improvements

A CONSIDERABLE amount of interesting information has been disseminated throughout the foundry industry on the use of nickel in various types in brasses and bronzes. According to work done by N. B. Pilling and T. E. Kihlgren of the International Nickel Company at their plant in Bayonne, N. J., nickel can be used to decided advantage in a variety of foundry mixtures.

Nickel Added to Six Alloys

The mixtures which they studied were as follows:

1. An 11 per cent tin-bronze of the type commonly used in worm gears.
2. A red brass—the common 85-5-5-5 mixture.
3. A yellow brass containing 1 per cent tin, 2 per cent lead.
4. G-bronze with 8 per cent tin, 4 per cent zinc.
5. The common 80-10-10 leaded bearing bronze.
6. A high lead content bearing bronze of the type used for locomotive brasses, with 6 per cent tin, 20 per cent lead.

In all of these mixtures nickel was introduced to replace a like amount of copper, the zinc, tin, lead and phosphorus contents remaining unchanged. Comparisons were made between a control melt free from nickel and others containing nickel substitutions of approximately 0.5, 1.5 and 3 per cent.

Results Obtained

The results of the work were summarized as follows:

Considered in a general way it appears that the tensile strength, compressive resistance and elastic strength of all six foundry mixtures are improved by small contents of nickel.

The best nickel content varies with the nature of the base mixture and in general, is lower, the higher the tin and/or lead contents; when these last two elements are limited to perhaps one or two per cent each, the advantageous action of nickel in increasing strength and toughness may be extended to contents which are certainly higher than the range considered in this investigation.

It seems to be a general characteristic of nickel to increase such properties as proportional limit and yield point to a considerably greater extent than would be expected from the change in tensile strength. In other words, nickel displays its strengthening action most markedly when the deformation involved is small.

The importance of this is, of course, evident in connection with castings subjected to service of such nature that failure may occur by distortion rather than by fracture. The extent to which the resistance of sand cast test specimens to incipient deformation has been increased by appropriate nickel contents is briefly summarized in Table 1.

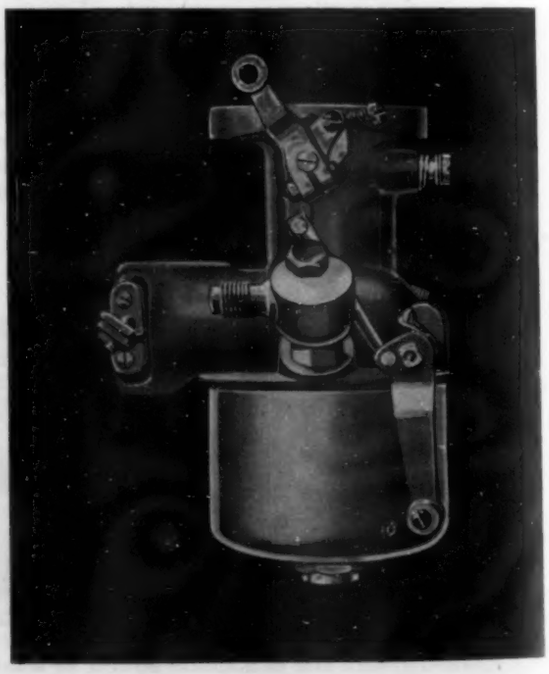
TABLE 1—EFFECT OF NICKEL ON RESISTANCE OF TEST SPECIMENS TO INCIPIENT DEFORMATION*

Mixture	Per Cent Increase in				
	Ni Per Cent	P L Tension	P L Compression	Yield Point	10 Per Cent Compression
Gear Bronze	2	25	25	15	20
G-Bronze	1.5	20	5	10	5
Red Brass	3	40	55	40	30
Yellow Brass	3	40	35	35	40
Bearing Bronze	1.5	5	15	10	15
High Lead Bronze	1	50	30	20	15

*From Some Effects of Nickel on Bronze Foundry Mixtures by Pilling and Kihlgren, a paper, read before the meeting of The American Foundrymen's Association, May, 1931.

Left — Bronze Bushing with Nickel Content.

Right — Nickel Bronze Carburetor.



Left — Nickel Bronze Valve.

Right — Nickel Bronze Worm Gear.

These changes in strength properties which have been discussed are in part understandable from the microstructural changes which accompany them. For a given pouring temperature, bronzes containing the **delta** constituent show somewhat greater amounts of it in the presence of nickel and the lead-rich constituent of the highly leaded alloys develops an involved surface of contact with the matrix in which it is embedded. It seems probable that nickel also dissolves in and hardens the **alpha** solution. Structurally, both G-bronze and yellow brass are scarcely affected by as much as 3% nickel, although the latter has its strength properties very considerably raised.

General Discussion of Effects of Nickel in Copper Alloys

There is close metallurgical similarity between nickel and copper. These metals alloy with each other over a wide range of mixtures. In general, nickel dissolves in, toughens and hardens the alpha phase of copper alloys. It is taken up by copper alloys at temperatures much lower than the fusion point of nickel. It is retained with a minimum of oxidation losses and it is free from segregation or liquation.

The foundry bronzes containing small amounts of nickel from ½ to 3 per cent employ the nickel as an addition agent which modifies the mechanical and casting properties of the alloy. Such additions are made to many of the common types of foundry bronzes.

Bronzes containing nickel from 3 to 10 per cent have superior high temperature properties, and a series has been developed having great hardness.

Bronzes with 10 to 30 per cent nickel have properties resembling nickel itself, such as great toughness, high strength at both atmospheric and elevated temperatures, whiteness of color and corrosion resistance.

It is generally known now, that although there is an almost endless variety of combinations of tin, lead, zinc and other metals with copper, almost all of the needs of bronze castings users can be supplied by less than a dozen mixtures. Nickel in amounts of ½ to 2 per cent in these bronzes has favorable effects on elastic properties, tensile strength, toughness, hardness, compressive strength, density, fluidity, impact resistance, grain size and maintaining the distribution of lead in high lead-copper alloys.

It is not uncommon to find a 25 per cent rise in the proportional limit brought about by the addition of nickel to a foundry bronze.

This is a valuable improvement as it tends to prevent the failure of castings by distortion. Tensile strength, compressive strength and hardness can be improved without decreasing ductility and sometimes with an increase in toughness. In resistance to shock, nickel has increased bronzes 25% to 40% in the Izod impact test values.

Casting properties are of course, of great importance as upon this depends the smoothness of operations in the foundry. Nickel does increase the melting point of bronzes slightly, but it does not decrease the ease of filling all parts of the mold. In some cases as little as ½ per cent nickel added to the mixture has resulted in increased lengths of run in the spiral fluidity test as great as 40 per cent. The results in the foundry is fewer misruns, wider casting range and lower pouring temperatures. Intercrystalline shrinkage pores are reduced, showing an increased density, better fracture and an increase in pressure tightness (reduction in the number of "leakers").

In the highly leaded bronzes, nickel has long been known to minimize lead segregation and bring about finer dispersion in this metal in these difficult mixtures.

The following is an interesting list of uses for castings in which nickel has been employed to advantage:

Bearings (½-2%)	Valves and Fittings (½-3%)
Engine bearings.	Globe valves.
Rolling mill bearings.	Gate valves.
Automotive bearings.	Sea valves.
High speed bearings.	Valve trim.
Car journal bearings.	Steam valves.
Crankshaft bearings.	High pressure valves.
Locomotive brasses.	Superheated steam valves.
Bushings.	Steam turbine valves and seats.
Bridge bearings.	Air, gas and water fittings.
Turntable bearings.	Slide valves.
	Hydraulic castings.

Stationary, Marine and Aero Shaft Bearings.

Miscellaneous

Gear blanks.	Paper mill rolls.
Worm wheels.	Paper mill rotary screens.
Lubricator parts.	Gun recoil sleeves.

Injectors.

Powdered Metals By Electrolytic Methods

By Dr. JOSEPH ROSSMAN
Washington, D. C.

An Extended Review of the Patents Covering This Method of Manufacturing a Material Which Has Aroused Great Interest and Seems to Have a Wide Field—Part 4, Conclusion*

British Patents

1. Johnson 2106 of 1865.

Copper powder is made by electrolyzing a solution of copper sulfate acidulated with sulfuric acid.

2. Thompson 1502 of 1893.

The process for producing finely subdivided lead is conducted as follows: Lead compounds are mixed in a pulverulent condition with diluted sulfuric acid, sulfates, or even merely with water and a suitable combining material (such as gelatine, glue, or the like) and formed into plates of a given thickness. The plates are then immersed in an electrolytic bath of diluted sulfuric acid or of the sulfates of the alkaline earths, and the plates which cause the conveyance of the electrolytic current placed opposite them. The positive pole of a source of current is then connected with these last named plates, and the negative pole of the same is connected with the plates holding the above named mixture. The current is then passed through until all the lead compounds are reduced to lead mud, which will take place in one or more hours according to the thickness of the layer which is to be converted.

3. Neumann 15,207 of 1899.

A solution of lead acetate is placed in a centrifugal apparatus and the lead precipitated as a spongy metal by the use of zinc or the spongy metal is eliminated from the solution electrolytically and deposited upon the sheet metal pieces or plates on the walls of the trough or tank of the centrifugal apparatus, and under the simultaneous employment of the centrifugal action.

4. Plimmer 13,756 of 1910.

Antimony powder is prepared as follows: By dissolving antimony trichloride or other salts of antimony in hydrochloric acid or other acids diluted with water or with an aqueous solution of an organic acid, such as tartaric acid and submitting same to the action of an electric current, the antimony is precipitated in a finely divided state. The proportions employed are 50 gm. antimony trichloride, 100 c.c. concentrated hydrochloric acid and 200 c.c. of water or 200 c.c. of from 2 to 5 per cent tartaric acid solution.

The current density employed is from 0.3 to 0.5 amperes and not less than 0.3 amperes, per square centimeter and the temperature at which the process is carried on should be from 20 degrees C. to 50 degrees C. Either platinum or antimony may be employed as anode.

The antimony is filtered off and washed with the aqueous solution of an organic acid, such as tartaric acid, until free from chlorides and then with water till free from acid. The antimony is then dried by the usual methods. The antimony thus obtained finds application in medicine.

5. Craig 6161 of 1913.

Copper powder is made as follows: An electrolytic bath is formed with a copper anode and with a lead or other suitable cathode. The cathode may be a tank or the like containing an electrolyte. The electrolyte is an acid solution of titanic sulfate containing about 6 per cent titanium salt and about 6 per cent of sulfuric acid. On the passage of a suitable electric current the titanic sulfate is reduced to the titanous condition at the cathode, copper from the anode passes into solution, and is precipitated in a finely divided condition by the titanous sulfate which is thereby again oxidized for further reduction at the cathode and re-use in precipitating further quantities of copper as they come into solution at the anode. Thus a relatively small amount of reducing agent present in the electrolyte is capable of effecting precipitation of large quantities of finely divided copper, and the process is continuous, simple and economical The reducing agent should be present in such quantity as to precipitate the whole of the copper which is dissolved from the anode. Convenient circulating means may be provided in the electrolyte for ensuring a free flow of electrolyte between the electrodes The copper may be recovered and removed from time to time by suitable means, for example settlement or filtration. Current in excess of that passing through the copper anode may be passed through the electrolyte to ensure reduction of all the oxidized precipitating agent produced.

Suitable conditions of current pressure and density are the following: The voltage 2 to 4 per electrolytic cell; the density 30 to 40 amperes per square foot of anode surface; the cathode surface to be much larger than the anode surface, say twenty times as large.

6. Leech and Slater 124,006 of 1919. (German 340,567.)

In the electrolytic preparation of tin paste it is usual to keep the electrolyte in circulation, so as to keep at any instant the concentration of stannous chloride or electrolytic solution uniform throughout the electrolytic vat or vats. The circulation also tends to maintain at any instant a uniform temperature throughout the electrolytic solution. But even with these precautions the temperature of the electrolyte may vary from time to time, and the concentration of stannous chloride in the electrolyte gradually increases, owing to the fact that hydrogen is produced at the cathode simultaneously with the tin and that an excess of tin goes into solution at the anode over and above that deposited at the cathode, such excess of tin being approximately chemically equivalent to the hydrogen liberated at the cathode. The character of the tin deposited at the cathode is intimately associated with the character and amount of the hydrogen production, so that all attempts to reduce the amount of hydrogen liberated causes changes in the character of the tin de-

*Parts 1, 2 and 3 were published in our August, October and November issues.—Ed.

posit. In general, the less the hydrogen liberated the coarser are the tin particles.

The present invention consists in using anodes formed partly of the active metal and partly of a material (for example, hard graphite) which resists or withstands the conditions of electrochemical action and does not disintegrate nor pass into solution. A group of vats is employed through which one and the same electrolyte is circulated, such group of vats being electrically connected in series or in parallel or supplied with current independently as the conditions require. Active and resistant material for the anodes may be arranged in separate vats.

The ratio of the active to the resistant areas of the anode is such as to give a constant concentration of the metallic salt in the electrolyte under the required conditions. This may be effected by removing an active part of the anode and/or adding a resistant part or vice versa, as becomes necessary from time to time to keep the variation in the concentration within the permissible limits, or by so directing the flow of electrolytic solution or of the electric current in a group of vats, that the effective production to "active" to "resistant" anode-area is increased or diminished according as it is necessary to increase or diminish the concentration of the metallic salt in the electrolyte. Means for raising and lowering the active and resistant parts of the anode relative to the level of the electrolyte in the vat or vats may be provided, in order that the ratio of the areas of the two parts of the anode may be quickly adjusted to any required value.

As an additional means of regulating the concentration of metallic salt in the electrolyte, the active metal, in plates or other convenient form, may be suspended from time to time in the electrolytic solution and allowed to dissolve chemically without being placed in electrical contact with the anodes.

The electrolyte is circulated through a cooling coil, thereby maintaining the temperature constant during the whole time of electrolytic deposition.

7. Gillespie 181,831 of 1922.

It has been suggested previously to deposit metals from solutions containing the metal to be deposited in a non-adherent form on a cathode from which the metal was removed by a scraper or by passing a current through the electrolyte so as to precipitate the metal, which is separated from time to time. It has also been suggested to circulate the electrolyte through a cell, while the metal was precipitated and collected in the bottom of the cell from which it was removed and separated from the electrolyte, the latter after regeneration being returned to the cell. It has also been suggested to circulate or agitate the electrolyte between the electrodes. In an electrolytic process for the production of bronze for coating paper it has also been suggested to circulate the electrolyte between the electrodes, the anodes partly consisting of the metal to be deposited.

According to the present invention the current which is passed through an electrolytic cell is of such a density that the metal which is carried from the anode formed of the metal to be deposited, preferably scrap metal, to the cathode by the electrolyte will be deposited on the latter in a non-coherent and non-adherent crystalline form while the electrolyte is passed rapidly between the anode and cathode so that it will remove and carry with it the metal powder which has been deposited on the cathode.

After the electrolyte has passed between the electrodes it is conducted into any suitable separating device in which the powder is separated therefrom, whereupon the electrolyte is returned to a pump and again circulated through the cell, after passing through a vat containing and supplied with the necessary chemicals for regeneration of the electrolyte.

In carrying the invention into effect the anode, which is the metal to be deposited, and the cathode are placed into a suitable cell, approximately 3/32" apart, and a solution of a metallic salt is circulated rapidly, for example, at about 10 feet per second, between them while a current of suitable density, preferably about 20 amperes per square foot, is passed through the cell. The cathode is preferably constructed of aluminum or copper and may be of any shape, simple or compound and either stationary or made to reciprocate or revolve.

8. Adam 253,958 of 1926.

The process consists in depositing metal electrolytically in a non-coherent form on a rotating cathode and removing the deposit by means traversing the surface of the cathode in a direction at an angle to that of the direction of rotation of the cathode.

French Patents

1. Jourdan 415,760 (1910).

Scrap metal is placed in perforated metal anode baskets surrounded by slotted metal cathodes. The current density is so regulated that metal powder forms which falls to the bottom of the cell.

2. Boivin 550,891 (1922).

Metal particles are made by passing an alternating current between metal electrodes immersed in an electrolyte.

German Patents

1. Berliner Accumulatoren-Werke 71,431. Oct. 11, 1893.

Powdered lead oxides are formed into a paste which is placed on grid plates. These are introduced as cathodes in a bath of dilute sulfuric acid producing powdered lead.

2. Berliner Accumulatoren-Werke 71,679. Oct. 7, 1892.

A process similar to the preceding patent in which the electrolyte contains iron, copper or zinc in solution.

3. Elektrizitats-Aktiengesellschaft 88,273. August 24, 1894.

The present process produces metallic crystals which are uniform and well formed. It is based upon the observation that the separation of crystals is attained most readily from an electrolyte which contains compounds in the higher oxidation stage (-ic), which may again redissolve the metal which is to be separated with the formation of the lower stage of oxidation (-ous). For the deposition of copper a solution of cuprous chlorid is used, which contains some cupric chlorid or iron chlorid. In the case of tin, a solution of a tin salt is used, containing iron chlorid (*ferric* probably) or ferric sulfate with small amounts of suitable organic substances added thereto.

4. Elektrizitats-Aktiengesellschaft 88,415. August 15, 1896.

The process of making a bronze powder consists in electrolytically depositing loosely cohering metallic crystals and then grinding them up into powdered form.

5. Allgemeine Elektricitats-Gesellschaft 316,748. Dec. 5, 1919.

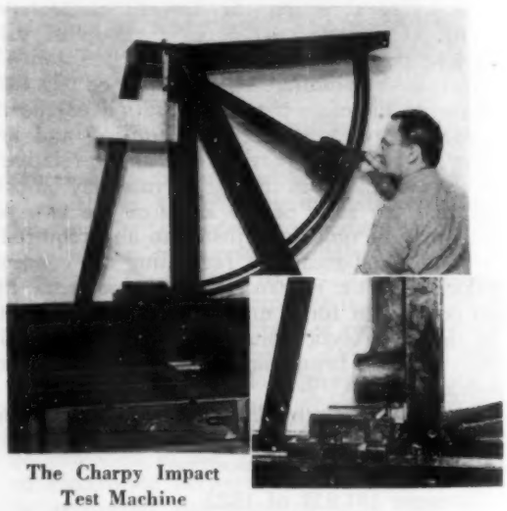
Iron powder is produced by electrolyzing a bath containing three parts ferrous chloride and four parts ammonium chloride in 100 parts water at ordinary room temperature using iron electrodes and a current density of 10 amperes per square cm.

Properties of Zinc Base Die Castings

Such Properties as Tensile Strength, Elongation and Impact Strength. Effect of Aging and Effect of Steam Test on "Zamak," a Series of Zinc-Base Die Casting Alloys. Comparisons With Other Cast Metals

AS a result of considerable research work a great deal of interesting and valuable information has been collected by The New Jersey Zinc Company on the properties of zinc base die casting alloys of various types; also methods of plating and finishing such castings. The work was done with a series of Zamak alloys, Zamak being the registered trade mark applied to the die casting alloys manufactured by the New Jersey Zinc Company, from Horse Head Special (99.99 per cent plus) zinc. The formulas for these alloys are covered by patents owned by the New Jersey Zinc Company. Licenses to make these alloys with Horse Head Special zinc under these patents have been granted to a number of manufacturers of alloys and certain commercial die casters who make their own alloys.

Table 1 shows the properties of these zinc die casting alloys.



The Charpy Impact Test Machine

TABLE 1. PROPERTIES OF DIE CAST ZAMAK ALLOYS†

	Zamak 2	Zamak 3	Zamak 5	Zamak 6
Composition				
Aluminum	4.10	4.10	4.10	4.10
Copper	2.70	—	1.00	1.25
Magnesium	.03	.04	.03	—
Balance Horse Head "Special" (99.99+%) Zinc				
Tensile Strength—Lbs./Sq. In.	47,300	36,100	41,600	39,600
Impact Strength (Charpy) as measured on ¼" x ¼" bar...	15.00	18.25	17.75	18.50
Elongation—% in 2 Inches	8.4	4.7	4.2	10.6
Compressive Strength—Lbs./Sq. In.	93,100	60,500	87,300	91,700
Brinnell Hardness	83	62	73	71
Specific Gravity	6.754	6.644	6.675	6.717
Melting Point	733.6°F.	727.9°F.	726.9°F.	731.8°F.
Solidification Shrinkage—Ins./Ft.	.1492	.1380	.1385	.1560
Modulus of Rupture—Lbs./Sq. In.	116,000	94,700	105,200	102,800
Transverse Deflection—Ins.	.22	.27	.16	.27
Shearing Strength—Lbs./Sq. In.	45,800	30,900	38,400	38,000
Specific Heat—Calories/Gm./°C.	.1047	.0980	.1024	.1036
Thermal Conductivity—Cal./Sec./Cm.³/°C.	.253	.273	.256	.266
Thermal Expansion—In./In./°C.	.0000277	.0000274	.0000274	.0000278
Electrical Conductivity—Mhos/Cm.³ at 25°C.	144,402	155,302	150,532	151,111
*Relative Fluidity in Seconds	87⅗	60⅗	66⅘	70
**Fluidity Number	114	166	151	143

† These values are the average of several casts and were determined 6 months after casting date.
* Time required for equal volumes to flow through standard orifice at constant temperature.
** Derived by dividing 10,000 by time in seconds to indicate comparative fluidity.

Twelve Small Gears Die-Cast in One Operation.

Impact Strength—Impact strength is the resistance to sudden shock, a most important physical property in any metal.

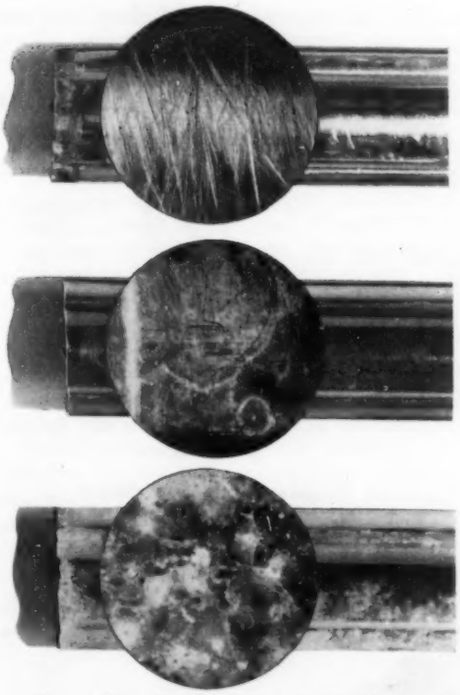
Table 2 compares the impact strength of die cast zinc alloys with other cast metals.

Table 2. Impact Strength

	Ft. Lbs. to Break ¼" □ Bar
Sand Cast Malleable Iron	8—12
Sand Cast Brass	>20
Cast Iron	0— 2
Die Cast Aluminum Alloys	2— 5
Die Cast Zinc Alloys made of Horse Head Special Zinc.	15—20

Plating and Finishing

As a result of varying types of tests on plated surfaces of zinc base die castings which covered actual surfaces of continuous outdoor exposure and salt spray exposures, the New Jersey Zinc Company recommends strongly that

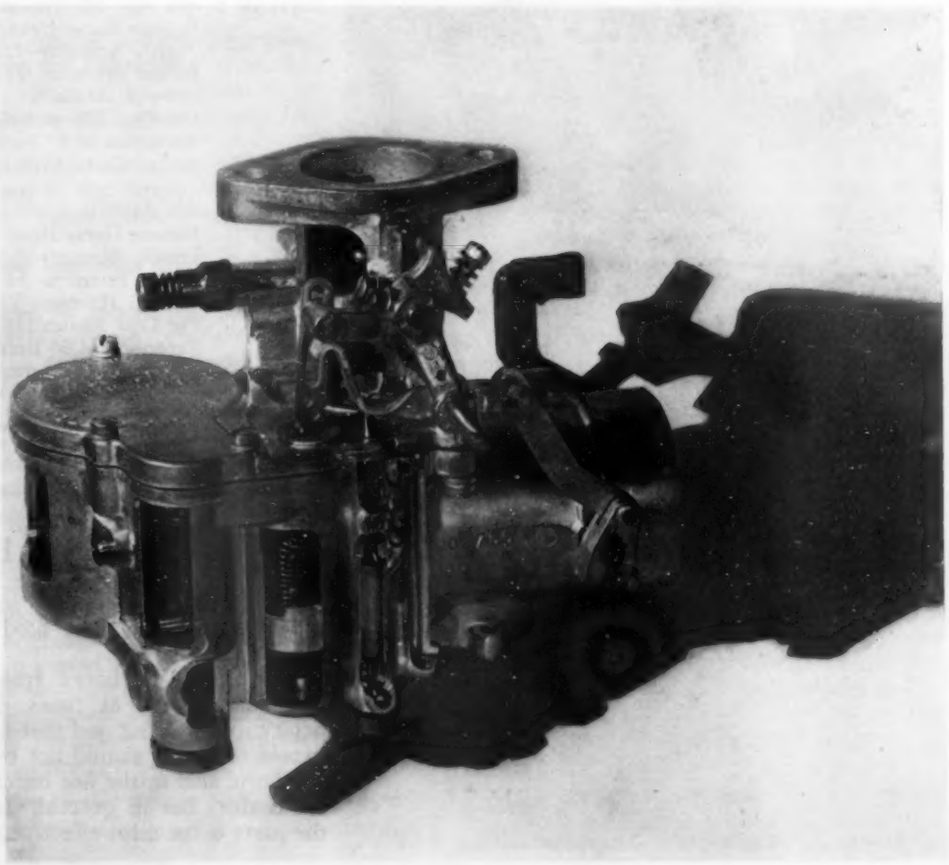


Actual Service 2 Years 3½ months (33,500 Miles)

Continuous Outdoor Exposure (7 Months)

Salt Spray Exposure (26 Hours)

Three Zinc Running Board Mouldings After Exposure on Identical Weights of Nickel-Chromium Plated Coatings.



High Grade Zinc Base Alloys Now Satisfactorily Withstand the Severe Service Conditions of Carburetors. (Sectionalized).

when such castings are plated with nickel and then chromium the undercoat of nickel should have a minimum thickness of 0.0003 inches and the chromium 0.00002 inches. See illustrations, column 2, page 471.

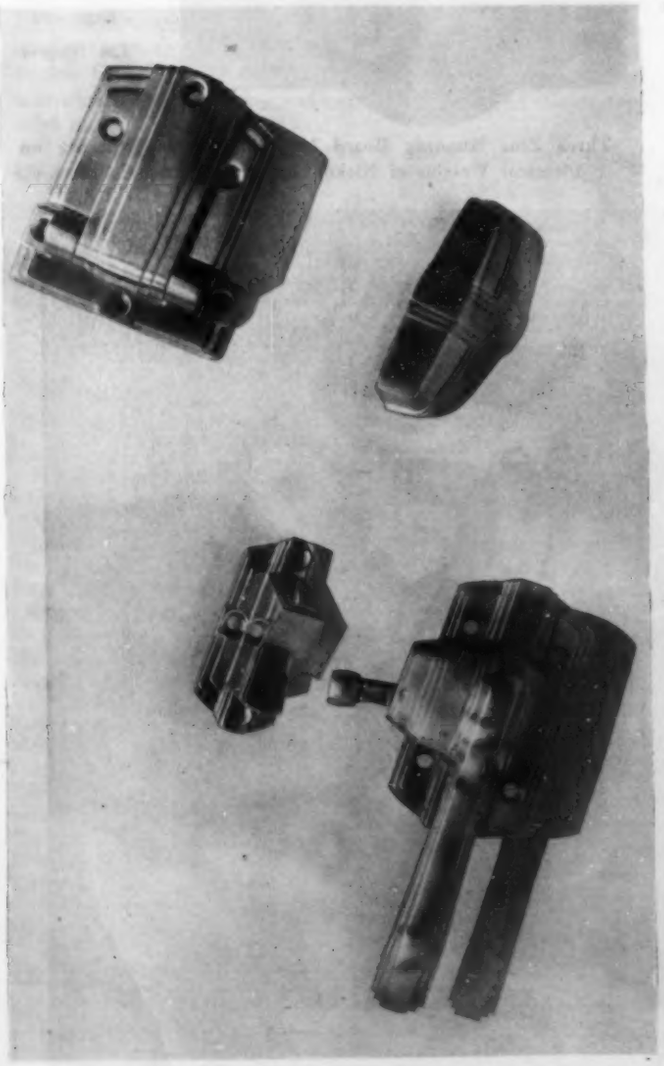
Tensile Strength

Table 3 below gives an interesting comparison between the tensile strength and elongation of die cast zinc alloys and other materials.

Table 3. Tensile Strength and Elongation

	Tensile Strength #/□"	Elongation % in 2"
Sand Cast Malleable Iron.....	50,000—56,000	12—22
Sand Cast Brass	25,000—35,000	10—28
Cast Iron	20,000—30,000	—
Die Cast Aluminum Alloys	25,000—35,000	1— 5
Die Cast Zinc Alloys ..... made of Horse Head Special Zinc.	35,000—55,000	4—10

Below—Refrigerator Hardware, Die-Cast, Nickel Plated and Buffed to a Soft Butler Finish.



One of the disadvantages in the past of zinc base die cast alloys has been their tendency to warp or "grow" with age. With the advent of the use of magnesium in minute quantities in these alloys, this tendency has been practically overcome.

Table 4 shows the effect of normal indoor aging on a series of zinc alloys.

Table 4. Aging Effect

		INDOOR AGING
	Original[1]	One Year
ZAMAK 2—4% Al.—3% Cu.—.03% Mg.		
Balance Horse Head Special Zinc		
Tensile Strength—Lbs./Sq. In...	47,300	47,800
Impact Strength—Ft. Lbs.	15.00	12.75
Brinnell Hardness	83	86
Per Cent Elongation in 2 Inches	8.4	6.7
Expansion of 6" Bars in Inches[2].	——	—.0003
No. of Casts Averaged		7
ZAMAK 3—4% Al.—.04% Mg.		
Balance Horse Head Special Zinc		
Tensile Strength—Lbs./Sq. In...	36,100	35,300
Impact Strength—Ft. Lbs.	18.25	18.00
Brinnell Hardness	62	65
Per Cent Elongation in 2 Inches	4.7	6.2
Expansion of 6" Bars in Inches[2].	——	—.0004
No. of Casts Averaged		7
ZAMAK 4—4% Al.—3% Cu.		
Balance Horse Head Special Zinc		
Tensile Strength—Lbs./Sq. In...	42,500	42,400
Impact Strength—Ft. Lbs.	8.75	5.75
Brinnell Hardness	76	75
Per Cent Elongation in 2 Inches	8.6	7.8
Expansion of 6" Bars in Inches[2].	——	.0093
No. of Casts Averaged		6
ZAMAK 5—4% Al.—1% Cu.—.03% Mg.		
Balance Horse Head Special Zinc		
Tensile Strength—Lbs./Sq. In...	41,600	40,800
Impact Strength—Ft. Lbs.	17.75	17.50
Brinnell Hardness	73	78
Per Cent Elongation in 2 Inches	4.2	4.1
Expansion of 6" Bars in Inches[2].	——	—.0008
No. of Casts Averaged		5
ZAMAK 6—4% Al.—1% Cu.		
Balance Horse Head Special Zinc		
Tensile Strength—Lbs./Sq. In...	39,600	38,600
Impact Strength—Ft. Lbs.	18.50	18.75
Brinnell Hardness	71	73
Per Cent Elongation in 2 Inches	10.6	9.5
Expansion of 6" Bars in Inches[2].	——	—.0005
No. of Casts Averaged		9

[1]Original properties were determined 6 months after casting date.
[2]Expansions were determined by using the lengths of the impact bars, after 6 months' normal aging, as the original measurements.

Removing Borax Flux

Q.—Could you suggest some chemical means of removing the borax flux used in brazing preparatory to tinning.

A.—The fused borax from brazing operations forms a coating which at times does give considerable difficulty in removing and that is one of the reasons why an excess of borax should not be used. A small amount of sulphuric acid in the hot water sometimes seems to loosen the coating but in general, the scouring and scraping of the parts is the most effective way of cleaning it.—J. C. T.

Industrial Metal Degreasing

A Description of the Most Modern Methods of Removing Heavy Grease From Metal Products Before Plating and Finishing*

THE problem of metal degreasing is one which has attained paramount importance in the last few years. This is especially true in those industries in which perfect electro-plating, metal finishing, lacquering and painting of metal surfaces is necessary. Several methods of surface treating and degreasing are in use, many of which not only furnish imperfect surfaces, but are uneconomical on account of labor involved.

Most known methods of metal cleaning and plating involve an initial buffing process to remove rust particles and to eliminate surface blemishes. This process frequently employs a hand or machine-applied buffing compound of either acid or strongly alkaline nature, which, if imperfectly removed, tends to accelerate rust and corrosion.

These buffing compounds have a tendency to fill in blemishes and microscopic crevices. By covering these minute depressions, a surface is obtained which, while having a smooth appearance, is really filled with dirt particles that do not allow the plating to adhere directly to the metal and instead cause it to blister. No hand-rubbing process is capable of removing all these minute particles, which strongly tend to adhere to a metal surface.

The use of organic solvents to remove grease and oil and to wash off other undesirable materials from metal surfaces is becoming more widespread in this country following years of successful use abroad.

Some companies using solvent degreasing methods have found it desirable to install large commercial degreasing machines. While such machines will soon pay for themselves through increased efficiency and reduced labor costs, degreasing requirements vary widely, depending upon the character of substances it is desired to remove and the type of part to be cleaned.

METHOD OF METAL DEGREASING USING ORGANIC SOLVENTS

There are two methods of organic solvent degreasing in common use today. When the degreasing is accomplished by liquid solvent in contact with the metal to be degreased, the method is known as "Liquid Phase Degreasing."

The other method in general use is that in which the parts to be cleaned are exposed to the vapors of the boiling solvent, and is known as "Vapor Phase Degreasing."

I. Liquid Phase Degreasing

In cases where it is desired to cleanse by means of immersion in the liquid solvent, certain principles must be kept in mind. It is advisable to have the solvent warm, as the cleansing action in all cases is greatly improved.

In commercial practice it has been found desirable to either agitate the liquid solvent or to constantly keep in fairly rapid motion the metal parts themselves so that every surface may be constantly exposed to active solvent.

In liquid phase degreasing it is necessary to have a solvent recovery unit. This may be arranged either to maintain a constantly changing bath, or for the distillation of the grease-laden solvent by batches.

Liquid phase degreasing does not prove to be nearly as satisfactory as vapor phase degreasing, owing to the fact that the metal is immersed in contaminated fluid. Since the bath contains considerable amounts of dissolved grease and suspended solids, the metal object emerges and dries covered with a film of small particles. For this reason the following method is recommended:

II. Vapor Phase Degreasing.

To clean a surface effectively by the vapor phase method, the vapors must condense immediately on contact and flow off, carrying away the grease and grit. Usually a shield or large mass of metal is placed on the hook above the part being cleaned to cause a flow of freshly condensed solvent to play over the entire surface of the greasy object. The shield is frequently provided with several projections pointing downward, to distribute the condensed solvent most effectively over the metal surface.

A suitable condensing arrangement is required within the cleaning tank, either on its upper walls or in the cover, to provide for vapors which will rise above the parts being cleaned. In many cases the wall of that tank in which the liquid is boiled is provided with a slot through which the heavy vapors of the solvent pass into another compartment. Here they are condensed and collected as pure solvent, free from grease, and are returned as liquid to the bottom of the cleaning tank. In such a system it is possible to maintain nearly continuous operation, occasionally concentrating the grease-laden solvent and drawing it off into a separate still. As soon as this solution is drawn out, the tank is filled with fresh solvent from the adjacent compartment, and while the process continues, the grease-laden solvent is distilled, condensed and drained into the same auxiliary tank, and the hot grease drained from the small side-still. The frequency of these purification cycles will be governed by the amount of grease which the solvent has accumulated.

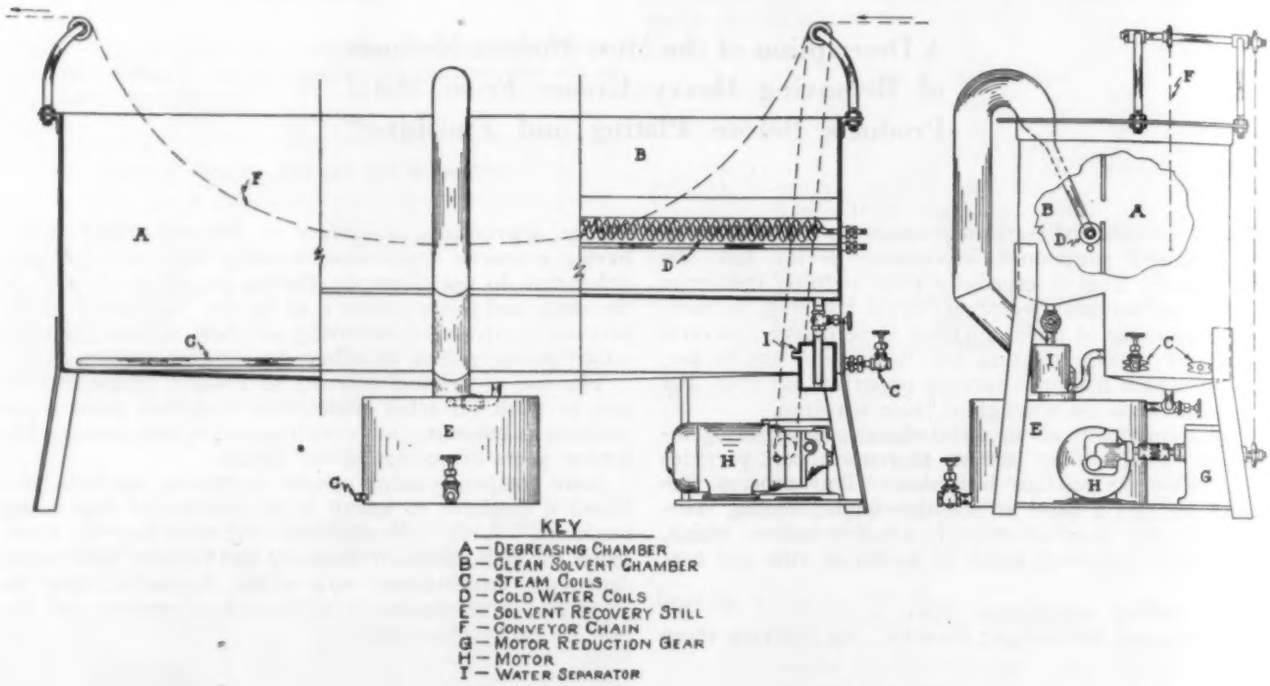
Owing to the high boiling point of the liquids used, the

* Abstracted from a Bulletin of the Dow Chemical Company, Midland, Mich.

metal to be cleaned is heated, the grease softened, dissolved and removed in a very short time. In most instances the cleansing is effected in a fraction of a minute. In no conceivable case does the cleansing require over five minutes. The basket or hook containing the parts being cleaned is timed in its transit through the vapor compartment so as to emerge with a cleaned article. In many cases the part being cleaned leaves the cleaning tank to enter another chamber which is furnished with a source of heat to drive off any solvent remaining on the metal.

The solvent may be condensed in an adjacent compartment and suitably returned to the system.

Sometimes successive vapor phase and liquid phase degreasing are combined in one process. In such a case the features of the process are essentially the same as those outlined in connection with the vapor phase system, with the addition that the part being cleaned is sprayed with clean solvent at the end of the run. This spraying is usually accomplished in a separate compartment of the cleaning apparatus, so as not to contaminate the solvent used in spraying with that which has removed the major portion of the grease in the vapor stage of the process.



SKETCH SHOWING ESSENTIAL PARTS OF VAPOR-TYPE DEGREASING SYSTEM

Deny Petition for Rehearing in Chromium Case

PETITION by International Silver Company, Meriden, Conn., for a rehearing in the Fink chromium patent case, which was decided some time ago in favor of United Chromium, Inc., New York, has been denied by Circuit Judges L. Hand, A. N. Hand and Chase, in the United States Circuit Court of Appeals for the Second Circuit. W. B. Morton and Ernest H. Merchant acted for the petitioner. The text of the decision follows:

"We find nothing in the petition which raises any points not already considered, except the objections to claims one, two and three. The proper interpretation of the term, "catalyst," contained in each is to be found by reference to the specifications. The prescribed catalyst is any acid or base containing a sulphate, fluoride, phosphate or borate radical (page 1, lines 52-58); claims one, two and three comprise only these. The same reasoning incorporates the proportions of the radical (page 2, lines 49-55). This interpretation is confirmed by the disclaimer itself, which as to claims one and two, is meaningless except as it refers to the composition of the bath, but is valid as a disclaimer since its basis was apparent in the specifications. The three claims are indeed somewhat redundant, and that is often, far too often the case; but we may construe them so as to save their validity when there is no compelling reason to do otherwise, as by the progressive specification of a single feature, in this case for example the hydrogen film. While they add little, here perhaps nothing, to the other claims, construed as we construe them, they are valid. We decline to consider the question, moot on this record, whether they can be construed more broadly.

"Petition denied."

Steps are being taken by the defendant to appeal from this decision to the United States Supreme Court.

Recent Developments in Metal Lacquers

By KENNETH R. LONGNECKER
Zapon Company, Philadelphia, Pa.

Compositions and Uses of the Varied Coatings Used to Decorate Metal Products

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, OCTOBER, 1932

THE electroplater might be called the inspiration of the lacquer industry, for it was he who was among the first to use lacquers and it is he who still uses a large percentage of the lacquers produced in this ever-growing industry. The plater learned the use of lacquer even before the invention of the now common spray equipment; and even with this new method of application, the arts of dipping, brushing and whizzing are still used, and the man who produces them is still an artisan. You are to be especially complimented on the beautiful examples of hand dip and hand brush work that are being produced.

Knowing of the sincere interest taken by every electroplater in the lacquer problems encountered in the finishing room, it is the object of this paper to discuss some of the recent trends in lacquer formulation, and more particularly the trend of your field—the formulation of metal lacquers.

Types of Lacquer Finishes

Briefly, among the developments of interest to finishers of plated articles should be:

1. The pearl finish and imitation plated finish
2. Synthetic resins and their use in enamels and clear lacquers
3. Decorating and details in plating operations, of chromium
4. The "non-spotting" or, more correctly, the "spotting-out retarding" lacquers

The pearl finish and imitated electroplated finish both use as their base concentrated pearl essence, or, as it is more commonly called, "fish scale." This essence is identical with that used in the manufacture of imitation pearl beads and gives either a mother of pearl or metallic effect. Strange to say, it is not ground fish scales, as is commonly believed, but rather is made from guanin. Guanin is a small crystalloid formation emanating from the internal organs of the fish, but lying around and covering the fish scales. One barrel of herring weighing two hundred and fifty pounds produces five pounds of fish scale and one hundred pounds of scale produce but one pound of pearl essence. This accounts for the high prices usually charged for pearl essence.

Since the beauty of this finish is formed by light reflections, and each piece of guanin is flat and leaflike in form, it is necessary to use with pearl essence a lacquer that dries quite slowly. This allows the particles to lie flat or "leaf" properly and gives the proper pearl effect.

In producing the pearl effect now commonly seen in automobile finishes and other novelty work, it is applied in the finishing coats after suitable primers and sand surfacers have been applied. From three to six coats of the pearl lacquer are then sprayed on. This lacquer is formulated from about 6 ounces of concentrated pearl essence, 20 per cent pigmented automobile enamel, and 80 per cent of a weather-resisting clear lacquer, per gallon. This formula may be varied. After the last coat is applied and dried, the body is thoroughly polished. The choice of pigment used is important, since dense or muddy colors do not give the proper depth of finish. Cobalt and Prussian blues and lake colors in maroons, purples and reds are most suitable.

The imitated plated finishes are usually obtained by the use of dyes to give a metallic effect. A pigmented or dye base background is applied and then a pearl lacquer containing pearl essence, clear lacquer and various proportions of dyes is sprayed on, either one or two coats. A top coat can then be applied if desired. Buffing is also used when desired. It will be of interest to you as platers, who may feel that this latter finish may some day encroach upon your trade, to know that the quite high cost of ingredients, the characteristic fading of dyes, and the delicacy of application will all tend to retard the growth of this finish.

Constituents of Lacquers

In the manufacture of nitrocellulose hardware lacquer, the three groups of products usually used are solvents and diluents, nitrocellulose and gums. For years these manufactures depended upon natural gums for their formulating, these being mostly obtained in Africa and the Orient from the fossilized resins of trees and shrubs. Because none of these resins had a steady source of supply with the exception of rosin, and because none of them met all the requirements of the expanding lacquer fields—the production of new or synthetic resins by chemical processes has developed. All of you have heard the term, "synthetic resin," used frequently in your trade papers and in conversation with paint and lacquer manufacturers. The first of these to appear on the market in the year 1893 was the now common ester gum. This is produced as the result of the chemical condensation of rosin and glycerine. If we substitute, in the place of rosin in the latter reaction, organic acids such as maleic and succinic and treat them with glycerine, the alky or glyptal resins are formed. Many variations in the organic acids used lead to widely different types of glyptals being obtained.

Everyone here has heard of the bakelite type resins. These are formed from phenol or, as it is better known, carbolic acid and formaldehyde. This type is little used in nitrocellulose lacquers, but modifications of this type are used and are known as "Amberols," "Paraplex" and "Beckasite."

From acetylene and petroleum distillation products we obtain the Vinyl Resins. These are in the experimental

stage of development but great claims of resisting corrosion are reported for them.

From the by-product coke ovens we obtain by polymerization of the distilled oils, the paracoumarone and paraindine resins.

The last common group of synthetic resins is obtained from benzol and chlorine and are known as chlorinated diphenyls or the trade name, "Arochlors."

Uses

Having briefly sketched the methods of manufacture, let us proceed to the more interesting uses. The greatest of these is, of course, their use in nitrocellulose lacquers. Our laboratory has recently completed testing a series of 150 panels, using all of the common natural and synthetic resins in a series of hardware lacquers. These panels were all brass escutcheons, approximately two inches by six, and were exposed for five months to the weather. When the test was completed, it was found that synthetic resins had surpassed the natural gums in every respect, they having better adhesion, less discoloration, being more impervious to the elements and handling better in the spray gun.

It was found that the synthetic resins dry more slowly and obtain their greatest adhesion to metal more slowly than natural resins. It takes 36 hours in some instances to obtain maximum adhesion.

Some of these resins are very flexible and hold their flexibility for long periods of time. They are known as "plastic resins" and are characterized by the Rezyl Balsams and Paraplex.

Concerning outdoor exposure tests, let me insert a bit of information that will be helpful. Recently, a well-known manufacturer ran a group of outdoor exposure tests of hardware lacquers on solid brass plates about six inches square. The finishing department, in making up these test plates, believed they were doing a favor to the usual supplier of their hardware lacquers by applying an extra heavy coat of that manufacturer's lacquer. This lacquer, although known to be satisfactory for these requirements, broke down more quickly than the other specimens in the test, the reason being too thick a film. Let me warn against the use of any but thin films for atmospheric exposure. The cause of this increased deterioration is additional absorption of ultra-violet rays in the sunlight which cause a more rapid breakdown of the film when refracted through a thicker film.

A large and growing use for synthetic resins is in synthetic enamels. These are composed almost entirely of various resins, pigments and solvents, with the addition, when necessary, of driers and other chemicals in small quantities.

The baking synthetic enamel came first and now the air-drying product is a reality. For the ideal enamel finish on metal at a low cost, the synthetic enamel should meet the requirements, since gloss, adhesion and covering power are all rated highly. This finish, while still in the experimental stage, bears watching and use by the finishing foreman, as many improvements have been made in the last few months and more will surely follow, one of the outstanding recent developments being increased resistance to moisture and soap and water. Some resins will stand 48 hours, immersion in cold water without appreciable softening or spotting.

Referring to my third recent development—stop-off enamels and enamels for use on plating racks have been developed and are used to a great extent. These are suitable not only for silver and brass plating, but also chromium work. Racks dipped or sprayed will stand up for long periods of use, while the "stop-off" enamels are for use only during the plating operation.

The decorating of chrome-plated hub caps, humidors, vanities, etc., proved a stumbling spot for the finisher for some time, due, of course, to the greaselike film on the deposit. Clear air-drying primers can now be used that successfully act as a bond coat between the chrome-plate and lacquer-enamels. This procedure simplifies many production schedules.

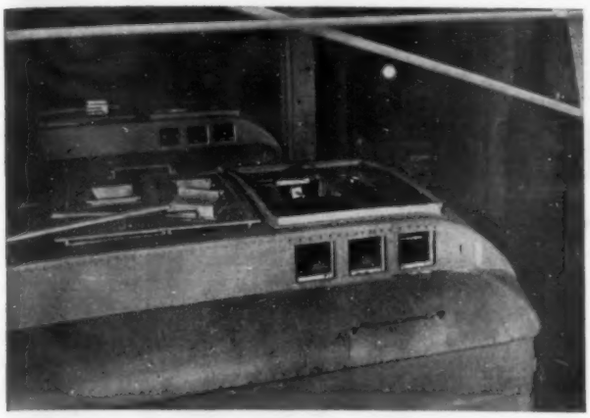
It is with hesitation that I approach the last section of this paper, namely, "non-spotting" lacquers, because I know that you gentlemen have had more practical experience with these than the chemist or technician. However, let us approach it from a sane and common-sense angle. First, let us acknowledge that there are two types of spotting—(1) "spotting in" or "crystal spotting," and (2) "spotting out" or "stain spotting." Chemists and others engaged in several industries have worked for a number of years to stop these annoying scars from disfiguring the art of the electroplater. Probably thousands of tests have been run, and I am glad to report that progress is being made. No lacquer has yet been made, to my knowledge, that eliminates spotting, but there are several good lacquers on the market that retard the growth of these annoying spots. After a number of years of work, it has been discovered that a good adhesive and impervious hardware lacquer, plus the addition of other chemicals, seems to have a retarding effect on the impurities from the plating solution and so retard the process of the spotting reaction. This leads one to believe that the thickness of film of such a lacquer would be inversely related to the speed of the spotting reaction. This is true within certain limits, but practicability of application and finishing costs limit the thickness of film that can be applied.

Let me close by saying that the lacquer manufacturer welcomes the suggestions and discussions of the plater on this latter problem or any others that they are mutually interested in solving. Feel free to give your thoughts to the manufacturer of finishing products and he in turn will be in a position to better meet your varied requirements.

Handbooks of Practical Data on Metal Cutting

If a super "speed boss" possessing and imparting all of the existing practical knowledge of cutting metals might visit all of the machine shops of this country and assist the men running them in bringing their metal cutting practice up to what may be achieved by their machinery and high-speed tools, it would be worth millions of dollars to the industry. A research committee of the Society is proposing to provide for such a "boss" as well as his visitations through the medium of handbooks to be published and sold by the Society. These handbooks would make readily available to shop superintendents, foremen, rate-setters, machinists, etc., authoritative data with respect to feeds and speeds at which machines should be operated in cutting each kind and grade of metal with each kind of commonly used cutting tool.

This project is to be undertaken by a subcommittee of the American Society of Mechanical Engineers Special Research Committee on Cutting of Metals, and is the outgrowth of a suggestion made several years ago by King Hathaway, consulting management engineer.



Photo, Copper and Brass Research Association

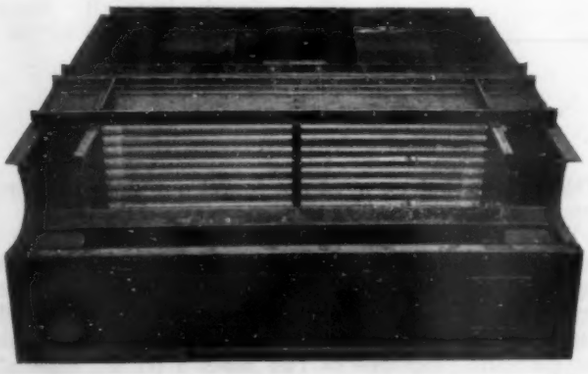
Cooling Tower for Air Conditioning a Railroad Car. Part of an Installation by Carrier Corporation.

Air Conditioning—A New Field for Metal Working

AIR conditioning is a comparatively new field of activity in which non-ferrous metals and electroplating are highly important. Most of the equipment requires a considerable amount of copper or brass sheet and tubing, which must be fabricated into a variety of shapes by forming, brazing, soldering and other metal working methods. Tin plating is also an important feature of many types of air conditioning installations.

Air conditioning in its latest forms provides for both heating and cooling of the air. Its most common applications have heretofore been in making theatres and other public buildings comfortable either in summer alone or both winter and summer. Its use is rapidly being extended to dwellings, railroad cars, hotels, and even industrial plants.

It is of interest that last month a contract amounting to more than $1,000,000 was awarded to the Carrier Engineering Corporation for an immense air conditioning installation at the Rockefeller Center, New York. It will have fifteen miles of duct work, with more than 1,000 outlets and returns. The installation ordered is only for the 72-story RCA Building.



Photo, Copper and Brass Research Association

Cooling Unit and Circulating Blowers in the New Carrier Steam Ejector Cooling System, Showing Banks of Aerofin Coils, Which Are All of Copper, Plated With Tin.

Aluminum Museum Cases Popular

YEARS of pioneer activity in the manufacture of special exhibition cases, especially the types required by museums, has resulted in remarkably wide adoption of the products of the A. N. Russell and Sons Company, Ilion, New York. This company has been in the business since 1871, and has made cases for most of the important museum and libraries of the country. The requirements of such cases are extremely rigid, due to the high value of the objects displayed in them. They must provide advantageous and convenient display, keep vibration at the very minimum, protect and preserve the exhibits, and must be of fine appearance without detracting attention from the exhibits they house. Continuous research and experimentation has been necessary, and the Russell company has steadily kept up such work, with the result that its products are very popular with museums.

Metal Cases Made by A. N. Russell and Sons Company for the Springfield, Mass., Art Museum.

The adoption some time ago of 51-ST aluminum, made by Aluminum Company of America, for production of Russell cases was in line with the company's efforts to improve its products. The metal was found desirable due to its good but unobtrusive appearance, its strength, lightness and fine workability, according to the Russell company. The cases are also made in architectural bronze, electroplated to any desired finish, and in wood. All have the special construction features which the company has developed. The aluminum cases are generally made with a standard satin finish. A wide variety of bases on which the metal cases are set are also made by the company. These are generally of wood, or combinations of wood, marble, rubber compositions, etc.

EDITORIALS

Back to Work

DESPITE the political situation in the United States today there are in operation forces which are making for business recovery. The policy of the Reconstruction Finance Corporation has been determined and is acceptable. It should not be discontinued. There is a strong movement to rebuild and revamp factory equipment for lower cost operation led by a committee of industrial leaders with A. W. Robertson, Chairman of the Westinghouse Electric and Manufacturing Company, at its head. It is going on without hesitation. The management approached to buy new equipment is not asked to expand, but to change in order to place its business on a stronger basis and to earn better profits upon present output. In order to secure the greatest measure of adaptability of present capacity to service requirements, in order to obtain increased flexibility in meeting sudden changes in conditions, in order to get increased productivity from present personnel, manufacturers know that they must replace obsolete or unsuitable equipment with new equipment of suitable design and to put the equipment that is to be retained in a first class condition by a thorough overhauling.

The Robertson Industrial Rehabilitation Committee reports pledges to date which involve an outlay of $70,000,000. These figures represent a gain of about 2 per cent of the total annual loss in income, now suffered by the capital goods industries. The outlook for success in the movement is bright for the real work has just begun.

A survey made by the American Machinist of obsolescence in the metal working industry shows that 44 per cent of the machines in the non-ferrous metal products field were installed prior to 1920; in other words, are more than ten years old. Here is proof positive that this branch of industry is "down at the heels." Mr. Robertson believes that it is time to start the most important spending now. He is giving proof of his belief by the considerable expenditures for rehabilitation being made by his company, the Westinghouse Electric and Manufacturing Company. His purpose and that of others who feel the same way, is not to "make work." The sole reason for modernization is the need for profits. Costs can be reduced—witness the record of the Bohn Aluminum and Brass Corporation of Detroit, Mich., which in its third quarter succeeded in showing a profit on a small volume of business whereas a short time before it had been running at a loss with much greater volume.

After only a few months of operation of the Reconstruction Finance Corporation applications for loans under the self-liquidating provisions of the Emergency Relief and Reconstruction Act aggregated more than $1,000,000,000. Huge volumes of work are pending in all parts of the country. It will be only a short time before these are set in motion and will give business the additional fillip which it needs to add to the improvement which it has already shown. That this work takes time to set in motion is no cause for criticism. Engineers point out that the Reconstruction Finance Corporation has faced the colossal task of building in a few months a financial enterprise comparable in magnitude to the whole field of American investment banking, requiring a century to develop.

The attitude and actions of American business will be the determining factor in restoring normal conditions in the next year.

The Copper Situation

THE outstanding occurrence of the past year in the copper industry has been the reimposition of an American import duty of 4c a pound. This was followed shortly afterward by a duty of 2d per pound by Canada.

According to L. Vogelstein, Chairman of the Board of the American Metal Company, the world's production at present is at the rate of about 930,000 short tons per year. Of this the United States produces about 307,000 tons, the British Empire about 212,000 tons and other countries, the balance. At the present rate of consumption we can use up our own production, namely about 300,000 tons, but we must not forget our stock of refined copper of about 650,000 tons.

We have an unusual situation in the copper market in this country. So far, in spite of the tariff, domestic copper is selling at very little above the figure for foreign copper, but Mr. Vogelstein sees no reason why American producers could not, should they so decide, raise the domestic price one or two cents a pound, especially in view of the fact that they control most of the domestic fabricating plants. No one is willing to predict the time when this anomalous condition will be corrected, as copper is not the only commodity suffering. All that can be said is that our present consumption is so subnormal that it is

easy to visualize a decided and continued upswing in the use of copper following improved conditions in general business.

A plan has been put forth by K. S. Guiterman of the American Smelting and Refining Company for copper to "come back" without waiting for "general" business improvement. According to Mr. Guiterman, copper has suffered from periodic attempts to control and maintain prices at false economic levels, and from the persistent refusal to adopt and maintain a fundamentally fair and sound policy of treatment of the ultimate consumer. Nevertheless the world consumption of copper has shown for a long period of time a fairly steady average annual rate of increase of between 5 and 6 per cent. The difficulty has been that the expansion in the industry has come in swings which at times far outstripped the world's requirements, and then it has had to wait for consumption to catch up. Thus for example we see that in 1929 the world produced over 2,100,000 tons of copper, an increase over 1928 of 11 per cent. However, it is his contention that the decreased consumption during the past two or three years has made up for this difference, establishing a reserve of consumptive requirements, and that the industry is not as top-heavy in capacity as is maintained in some quarters.

Mr. Guiterman suggests the formation of a new corporation to replace Copper Exporters, Inc., this corporation to be subscribed for by the copper-producing companies on a pro rata basis of capacity. The stockholders are to sell to the corporation 400,000 tons of refined copper at 5c a pound, requiring an outlay of $40,000,000. This expenditure is to be covered by $32,000,000 in 8 per cent 5-year notes, which, together with the capital funds to be subscribed will provide a surplus of over $2,000,000 in the hands of the company, to be used as working capital. This copper, which is collateral for the notes, is to be disposed of at a price not in excess of 12c per pound, the point being that it is assumed conservatively that within five years, general world conditions will be such as to provide a basis for such a market price. The removal of 400,000 tons of copper from the present surplus stocks for such a length of time would put the market in a much sounder condition.

The company would also function as the single American seller in foreign markets after the fashion of the present organization, Copper Exporters, Inc.

How this plan will appeal to Europe, whether they will buy American copper now that we have a tariff and they have increasing supplies from Africa, are questions unanswerable at this moment. There are conferences going on and in prospect between copper producers all over the world. Evidently the copper industry realizes that it must set its house in order. Speed the day.

Magnesium—Up and Coming

MAGNESIUM, which is daily becoming better known to the industrial world, is an extraordinary metal, primarily because of its light weight. It has a specific gravity of only 1.74, about 30 per cent less than aluminum. In recent years, the production of magnesium has expanded and the price has receded to the point where now it can compete on a cubic foot basis, with other metals.

Magnesium is most useful, of course, when alloyed with other metals, such as aluminum, manganese, cadmium, zinc, tin or copper. Most of the new alloys of magnesium contain 90 per cent or more of that metal as a base. The leading magnesium alloys in this country at the present time are the Dowmetal series which have been interestingly described by L. B. Grant.

Most castings with a magnesium base contain from 6 to 8 per cent aluminum and 0.2 to 0.4 per cent manganese. The 8 per cent aluminum alloy can be heat treated to a tensile strength of 28,000 and an elongation of from 8 to 10 per cent. Magnesium base alloys for fabrication usually contain 4 to 6 per cent aluminum and 0.3 to 0.4 per cent manganese in the wrought condition. This type of alloy can be brought to as high as 35,000 to 40,000 pounds tensile and 10 to 15 per cent elongation.

Care is of course, necessary in foundry practice that magnesium may be protected from oxygen for which it has a great affinity when it is approaching its melting point. Gating must be carefully designed to prevent oxide skins and mechanically entrapped air.

Magnesium alloys are well adapted to hot working as they are more malleable at elevated than at room temperatures. They can be welded without difficulty. Machining is easy as all alloys may be turned at maximum lathe speeds without danger of overheating or tearing.

Naturally, the first demand for magnesium alloys came from the aeronautical industry in which typical applications are crankcases, cover plates, housings, wheels, instrument mountings, seats, trim, etc. It is expected that similar savings in weight without sacrifice of strength, will lead magnesium into other fields, such as the automotive, portable tools, etc.

Magnesium has been on the horizon for a number of years. It seems to have overcome its difficulties and to be well on the way to taking a prominent place among industrial metals.

Plating Developments

EVEN in a bad year, even in times of stress and difficulty the progressive and wideawake industry does not lag. And among such industries surely belongs metal finishing.

It is unnecessary to list every detail of improved equipment, supplies and processes to prove this point. We have had at least four interesting developments during the past year.

A new method of cleaning metals has made long strides—the removal of heavy greases by what is known as liquid or vapor degreasing, using organic solvents. This method which is rapidly becoming more widespread, is a preliminary cleaning, before the final "regular" cleaning which immediately precedes the rinse and solution tank.

The point is that the degreasing method takes a heavy burden off the shoulders of the cleaning tank, making it much more effective and economical to operate.

Another development which is beginning to arouse interest is tungsten plating, its primary object being the protection of metal products from the attack of hydrochloric acid. Still another process which is gaining steadily is the anodic oxidation of aluminum with its adaptability to subsequent coloring.

Lacquers have not stood still. They now comprise the pearl finish, the imitation plated finish, the use of synthetic rosins in enamels and clear lacquers, the decoration and detail work by means of proper stop-offs in chromium and other types of plating, and the "spotting-out retarding" lacquers which, while not yet absolutely perfect, have improved to such an extent that there are now several good lacquers on the market which retard the growth of these annoying spots.

These developments are far from unimportant. They prove the alertness of the industry and promise well for its future.

New Books

Protective Films on Metals. By Ernest S. Hedges. Published by D. Van Nostrand Company. 270 pages; size 5½ x 8½. Price $5.00.

This book is largely devoted to the problem of corrosion and methods of retarding it. It begins with an explanation of the mechanism of corrosion, treating of the effect of oxygen on metals and the recently discovered information about protective films.

A large part of the book is devoted to the descriptions of different methods of applying protective coatings on metals, including hot dipping, electroplating, metal spraying, sherardizing, calorizing, lacquering, enameling, etc.

It is a first-rate summary of the problem of corrosion and the various methods in use so far, to combat it.

Industrial Management in This Machine Age. By F. A. Westbrook. Published by Thomas Y. Crowell Company. 400 pages; size 5½ x 8½. Price $3.50.

The author of this book is well known to readers of THE METAL INDUSTRY, having written numerous articles for us on mill and plant operation. He discusses, in this book, the newly developed and rapidly changing art of management of industrial organizations; in other words, how modern mills and plants are run. Himself a practical engineer and a writer of long experience, he has had ample opportunity to investigate many industries and to acquire first hand information. This book is the result of visits to scores of industrial plants.

Mr. Westbrook's findings are presented in unusual style, namely the "case" or illustration method. He first describes a system and then immediately illustrates it by a practical example in which it is in actual operation.

The book is written in a pleasing, simple style, not heavy in any way, but it is at the same time carefully checked for accuracy and is unquestionably authentic.

Chromium Plating. By E. S. Richards. Published by J. B. Lippincott Company. 128 pages; size 5 x 7½. Price $3.50.

This is a preliminary announcement of a new book devoted entirely to chromium plating. An extended review by one of our editors will be published in an early issue.

Text Book of Metallurgical Problems. By Allison Butts. Published by McGraw-Hill Publishing Company. 425 pages; size 6 x 9. Price $4.00.

This book follows to some extent in the footsteps of the earlier work in the field of metallurgy, Metallurgical Calculations by Richards, the last edition of which was published in 1918. Its purpose is not to replace Metallurgical Calculations, but to supplement it, in the sense of being more suitable for students primarily than for the practical working metallurgist. It presents a large number of practical problems designed to accompany courses in metallurgy, and gives examples of the methods used in calculation.

The field covered is broad, including metallurgical work of all sorts, the smelting of all types of ores, ferrous as well as non-ferrous, copper converting, refining, hydro-metallurgy and electrolytic processes.

The book will be a worth while addition to the reference library of any metallurgist because of its breadth of scope and its explanation of the use of fundamental principles of chemistry and physics in the solution of practical problems.

Plastic Working of Metals. By E. V. Crane. Published by John Wiley and Sons. 326 pages; size 6 x 9. Price $4.00.

The "plastic working of metals" is a general term covering the manufacture of metal products by forming as distinguished from metal cutting processes. It is a complete description of every type of operation involved in forming: bending, cold working, drawing, forging, extruding and even hot working metals. The book is essentially practical in character, being written by a man at work with one of the largest manufacturers of equipment used in the field. At the same time its practical nature does not obscure the fundamental, scientific aspects of the problem with which the author is thoroughly familiar and describes in detail.

Tin Solders: A Modern Study of the Properties of Tin Solders and Soldered Joints. By S. J. Nightingale. Published by the British Non-Ferrous Metals Research Association, Regnart Buildings, Euston Street, London, N.W.1, England. Price, 5s. net.

The information which this book affords is based on scientific research and since such knowledge enables the selection of the best solder for particular applications, the data is of economic and technical value to the buyers and users of these alloys. It should prove of particular interest to subscribers of METAL INDUSTRY, as it covers the entire field of solders and soldering, including tin solders, solder alloys, physical properties, strength of joints, alloying, practical considerations, and the choice of a solder for a particular job.

In his preface the author points out that solder is important because it is one of the most essential and expensive industrial materials. The publication of any matter which makes for improved solder or soldered joints is, therefore, justifiable technically and economically. This book is intended more for those who actually use solder than for those who make it or buy it, and, consequently, the factors which bear on the technique of joint making and those which influence the choice of the most suitable solder for a given service are stressed at the expense of points of more academic interest.

Solder is a very interesting material intrinsically and of wider appeal than many industrial metals because of the vital part it plays in the domestic amenities. It is not always remembered how much we depend in our everyday lives upon solder and upon the artisan or craftsman who uses it so skillfully. This book is dedicated "to plumbers and tinsmiths, to electricians and cable jointers and to those who have need of solder."—A. E.

Electrical Dictionary. A proposed dictionary of electrical engineering terms, representing the results of over three years' work by a committee of 120 scientists and engineers under the chairmanship of Dr. A. E. Kennelly of Harvard University, has just been published for review and criticism prior to its submittal to the American Standards Association for adoption as an American Standard. The report, prepared under the direction of the American Institute of Electrical Engineers, is a document of 208 pages listing over 3,400 definitions ranging from the fundamental definitions on which the science of electricity is based to definitions for practical applications, such as those for control equipment, generation, transmission and distribution, welding, illumination, wire and radio communication, electrobiology, and electro-therapeutics.

Government Publications

United States Government publications are available from the Superintendent of Documents, Government printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, apply to governmental body responsible for publication.

Annual Report of the Director of the Bureau of Standards to the Secretary of Commerce, for 1931-32. 10 cents.

Wheelbarrows. Bureau of Standards. Simplified Practice Recommendation R105-32, effective April 1, 1932. 5 cents.

Financing the Construction of Self-Liquidating Public Projects Through the Reconstruction Finance Corporation. An address by Harvey Couch, a director of the corporation. Government Printing Office. Free.

Nickel Silver. Federal Specifications Board, Washington, D. C. Submission of proposed revision, F. S. No. 468, Federal Specification for Nickel-Silver (German Silver) Bars, Rods, Plates, Shapes, Sheets and Strips. Superseding U.S.G.M.S. 468. Comments of interested parties are invited, and should reach Board within 10 weeks from November 30, 1932. **Copper-Nickel Alloy.** Same data as above applies to F. S. 585 on Copper-Nickel-Alloy, dated December 2. Copies free from Board.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Black on Chromium

Q.—Enclosed you will find a shoe buckle which we are chromium plating, and spraying with black japan. We find that the black we use does not give enough lustre. Could you recommend a better black that would give us better results?

A.—The sample shoe buckle has been finished poorly. We suggest that the buckle be steel ball burnished as bright as possible, then nickel plated for five minutes or just long enough to produce a clean bright deposit of nickel, and then chromium plated. To fill in the background with black, spray the buckle with a glossy black enamel and relieve the highlights with a piece of chamois moistened with thinner. After relieving, if the black is not glossy enough, spray with a coat of clear lacquer.

Any of the lacquer manufacturers that advertise in METAL INDUSTRY (see Buyer's Guide) can supply you with the proper grades of enamel and lacquer.

O. J. S., Problem 5,150.

Blackened Copper Finish

Q.—I am sending you a sample with finish I am trying to match. Will you please give me the method for doing this?

A.—The sample finish that you have submitted is produced in the following way:

The work, after being bright dipped, is dipped into a solution of copper sulphate 16 oz., muriatic acid 1 quart, water 3 quarts. It is left in this solution for about one minute, or until a copper color is produced, rinsed in clean cold water, and blackened in a hot solution made of liquid sulphur 1 oz., water 1 gallon. The work as it comes from this solution will have a dark smut, which is removed by scratchbrushing dry on a fine crimped wire brass wheel. The finish is lacquered to preserve it.

With a little experimenting you should have no trouble in duplicating the finish. It is important not to leave the work too long in the copper sulphate solution.

O. J. S., Problem 5,151.

Copper and Nickel Analyses

Q.—We are sending samples of our copper and nickel solutions. Please analyze. (Edmonton).

A.—Analysis of nickel solution:

Metallic nickel	4.11 oz.
Chlorides	2.62 oz.
p.H.	5.2

Analysis of silver solution::

Metallic silver	0.075 oz.
Free cyanide	0.33 oz.

O. J. S., Problem 5,152.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all blanks if possible.

Date .....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.: .....**Cathode surface, sq. ft.:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

Copper Plate Burns

Q.—We are sending sample of copper sulphate solution. We plate iron and steel with this, preparatory to nickel and chromium. We use 1,600 gallons.

Lately we have had trouble with burned edges on the work and a tendency to peel when buffed. The iron or steel is cleaned in a standard cleaner, scoured with pumice, given a 15 minute nickel deposit, rinsed, given a 30 minute copper deposit, buffed, nickel plated 45 minutes, buffed, and chromium plated. Recently we added 6 lbs. of molasses to the copper solution.

A.—Analysis of copper solution:

Metallic copper	2.72 oz.
Sulphuric acid	2.26 oz.

The solution is in a very poor condition. It is low in both the above constituents, and also contains a high per cent of iron. It would be advisable to discard the solution and make a new one.

If you care to try replenishing the solution, add 14 oz. copper sulphate to each gallon. Do not add any more molasses as it is not necessary to add this material to an acid copper solution.

O. J. S., Problem 5,153.

Copper Solutions

Q.—What is your opinion as to the relative merits of copper plating solutions made with copper carbonate and sodium cyanide, and those made with copper cyanide and sodium cyanide?

A.—There seems to be a difference of opinion, especially among the older platers, as to the merits of a cyanide copper solution that has been prepared from copper carbonate and sodium cyanide or one prepared from copper cyanide and sodium cyanide. We have operated both types of solutions and have found no difference in the character of the deposit as long as the metal, free cyanide and carbonate contents were the same in both solutions.

Personally we prefer to use copper cyanide in making and replenishing the bath, for several reasons. The cyanide of copper is more easily put into solution; less sodium cyanide is used; it is cheaper to operate; and the carbonate content does not build up so rapidly.

O. J. S., Problem 5,154.

Nickel Plate

Q.—We are sending you sample of a nickel plated brass cap. Please let us have all the information you can as to how the finish on this cap is obtained. Please advise whether it is burnished or acid dipped prior to nickel plating. We would also like to have the nickel formula for this kind of work.

We are barrel plating other articles which we prepare with a bright acid dip and then plate, but we are unable to get as high a finish as that shown on this sample cap, and cannot get nearly so good a finish on the inside.

Does this finish require a special kind or quality of brass?

A.—The cap has been finished in the following way. First, the grease or oil from the rolling or pressing operation is removed by tumbling in sawdust in a wooden barrel. It is then brightened in a good working bright dip solution, and steel ball burnished. The brighter the finish obtained from the steel ball burnishing operation, the brighter the finish will be after nickel plating. Use plenty of good clean burnishing balls, ¼" in diameter, with a good grade of soap chips, and if a vertical burnishing barrel that is wood lined is used, the speed should not be over 30 R.P.M.

After the burnishing operation, dry in clean hardwood sawdust if the work is to be kept any length of time before nickel plating. Clean in an alkaline cleaning solution to remove any soap film; rinse in clean cold water; pass through a 25% muriatic acid pickle; rinse in clean cold water; place in nickel barrel.

The barrel should not be loaded too heavily, and should be operated at 10 R.P.M.

The following formula will produce a good bright finish:

Double nickel salts	8 oz.	
Single nickel salts	8 oz.	
Sodium chloride	3 oz.	
Boric acid	3 oz.	
Water	1 gallon	P.H. 5.8

For a brightener, cadmium has been used, and can be prepared as follows: take 1 oz. cadmium chloride; dissolve in water to make 1 quart; for each ten gallons of solution use one fluid ounce of the stock cadmium solution, which is usually enough to produce a bright deposit. If more is used care must be taken to avoid an excess which would cause the deposit to become very brittle and also dark in color. With a little experimenting you should be able to duplicate or better the finish on sample submitted.

O. J. S., Problem 5,155.

Plating Non-Metallics

Q.—Kindly give us at your earliest convenience formula for copper and silver plating on wood.

A.—The surface of the wood should be made as smooth as possible and then sprayed with a wood lacquer or shellacked to make the wood impervious to the plating solutions. When perfectly dry it is sprayed with plater's copper bronze powder which is mixed to 4 parts thinner, 1 part lacquer. (To one pint of the lacquer thinner mixture use 1 ounce of bronze powder.) Use what is known as a silver lacquer, or one that contains very little or no gums.

It is customary to spray two coats of the bronze powder on the work, and leave it to dry thoroughly. After drying, immerse in the regular silver solution for a few seconds. Then the work should be covered with a film of silver. Rinse in clean cold water and plate in an acid copper solution until the desired thickness of copper deposit is obtained. After copper plating any finish can be put upon the copper deposit.

O. J. S., Problem 5,156.

Rustproofing for Lacquer Enamel

Q.—We have a job which our customer wants rust-proofed and then finished in lacquer enamel. We understand that electro-galvanizing is not satisfactory for this, but have never experimented and therefore are not sure.

How would cadmium plating work under lacquer enamel? What would be the plating cost for cadmium in relation to zinc?

A.—Lacquer enamel applied directly to a zinc coating has very poor adhesion. If the surface of the zinc is oxidized, good adherence is had. This may be accomplished by applying a thin coating of a solution made of copper sulphate 8 oz., water 1 gallon, acetic acid 1 pint. When this solution is applied, the surface of the zinc becomes dark grey or black. After this oxidation the surface should be washed with clean water and dried before enameling.

Lacquer enamel manufacturers have an oil base primer that gives good adhesion when applied to the surface of some metal before enameling. We would suggest that you get in touch with them. (See Buyer's Guide pages.)

The cost of cadmium plating, compared to zinc plating of the same thickness, is considerably greater, and a special primer would be necessary to obtain satisfactory adhesion of the lacquer enamel.

O. J. S., Problem 5,157.

Spots on Bronze Finish

Q.—We are enclosing a sample of brass with an oxidized bronze finish produced by means of sodium sulphide solution. From time to time we have complaints concerning spots such as those shown on the sample, and we wonder whether you can tell us the cause of these spots and how their formation can best be prevented.

A.—These are known as crystal spots, and only appear on metals having an oxidized surface; that is, a surface colored with copper sulphide or other sulphides and subsequently lacquered.

Crystal spots have been found by X-ray examination to consist of cuprous sulphide growing usually between the layer of cuprous sulphide on the metal and the lacquer film. Their formation is caused or accelerated by sulphur in even minute amounts, and may be derived from sulphur or hydrogen sulphide in the atmosphere, or from rubber bands or wrapping paper on cardboard cartons.

The only promising remedies are exclusion of sulphur from the surroundings, the use of lacquers that have been found to retard spotting, the application of a thin film of grease such as petrolatum to the lacquered surface and the use of wax paper for wrapping.

Write to the Bureau of Standards, Washington, D. C., for a copy of "Spotting of Plated or Finished Metals," by W. P. Barrows.

O. J. S., Problem 5,158.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,873,223. August 23, 1932. **Porous Metal and Method of Forming the Same.** Charles F. Sherwood, Highland Park, Mich., assignor to Sherwood Patents, Ltd., a Corporation of California.

1,873,363. August 23, 1932. **Coated Iron or Steel Article and Method of Making the Same.** Robert R. Tanner, Detroit, Mich., assignor to Parker Rust-Proof Company, Detroit, Mich.

1,873,801. August 23, 1932. **Crucible Furnace.** Harold E. White, Zelienople, Pa., assignor to Lava Crucible Company of Pittsburgh, Pittsburgh, Pa.

1,873,826. August 23, 1932. **Apparatus for the Electrolytic Deposition of Metals.** Michael Devecis, Budapest, Hungary, assignor to Societe Anonyme Waldberg, Paris, France.

1,873,889. August 23, 1932. **Method for the Preparation of Chromium Trioxide.** Paul R. Hines, Elyria, Ohio, assignor to The Harshaw Chemical Company, Cleveland, Ohio.

1,873,945. August 23, 1932. **Materials Coated with Lacquers, and a Process of Producing Coatings.** Georg Kraenzlein, Frankfort-on-the-Main-Hochst, and Richard Karl Muller, Bad Soden-on-the-Taunus, Germany, assignors to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany.

1,874,090. August 30, 1932. **Preparation of Rare Refractory Metal Powders by Electrolysis.** Frank H. Driggs, Bloomfield, N. J., assignor to Westinghouse Lamp Company, a Corporation of Pennsylvania.

1,874,253. August 30, 1932. **Breaking Down of Metals.** Vincent L. Dickson, Alameda, Calif.

1,874,617. August 30, 1932. **Non-Ferrous Alloy.** William B. Price, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn.

1,875,346. September 6, 1932. **Mold or Matrix for Plating.** Arthur K. Laukel, Detroit, Mich.

1,875,911. September 6, 1932. **Welding of Copper.** William Andrews, Norton-on-Tees, England, assignor to Imperial Chemical Industries Limited, London, England, a British Company.

1,875,962. September 6, 1932. **Polishing Machine.** George W. Veale, Cleveland Heights, Ohio, assignor to The Eaton Manufacturing Company, Cleveland, Ohio.

1,876,073. September 6, 1932. **Process of Casting Light Metals in Sand Molds.** Edward Player, Astley, England, assignor, by mesne assignments to Magnesium Development Corporation, a Corporation of Delaware.

1,876,131. September 6, 1932. **Process for the Treatment of Articles Made of Magnesium or High Percentage Magnesium Alloys.** Adolf Beck, Bitterfeld, and Hugo Dibelka, Dusseldorf-Oberkassel, Germany, assignors, by mesne assignments, to Magnesium Development Corporation, a Corporation of Delaware.

1,876,156. September 6, 1932. **Plating Zinc-Tin Alloy.** Merrill M. Thompson and James C. Patten, Indianapolis, Ind.; said Thompson assignor to said Patten; Margaret Lucile Patten, executrix of said James C. Patten, deceased.

1,876,261. September 6, 1932. **Apparatus for Casting Metals and Metalloids.** Georg Pemetzrieder, Berlin-Tempelhof, Germany.

1,876,262. September 6, 1932. **Alloy with Copper as Primary Metal.** Georg Pemetzrieder, Berlin-Tempelhof, Germany.

1,876,278. September 6, 1932. **Plate Catcher and Cleaner for Tinning Machines.** Samuel E. Diescher, Pittsburgh, Pa., assignor to S. Diescher & Sons, Pittsburgh, Pa.

1,876,617. September 13, 1932. **Refining Lead.** Michael George Corson, Jackson Heights, N. Y., assignor to National Lead Company, a Corporation of New Jersey.

1,876,732. September 13, 1932. **Metallurgical Apparatus.** Heinrich Neuhauss, Dusseldorf, Germany, assignor of one-half to Guilliam H. Clamer, Atlantic City, N. J.

1,876,733. September 13, 1932. **Sintering Mechanism.** Heinrich Neuhauss, Dusseldorf, Germany, assignor to The Ajax Metal Company, Philadelphia, Pa.

1,876,821. September 13, 1932. **Soldering Apparatus.** Thomas J. Dugan, Lakewood, Ohio, assignor to Martin J. O'Donnel, Lakewood, Ohio.

1,876,940. September 13, 1932. **Die Casting Machine.** Edward Hotter, Chicago, Ill.

1,876,960. September 13, 1932. **Annealing Furnace.** Charles F. Kenworthy, Woodbury, Conn., assignor to Charles F. Kenworthy, Inc., Waterbury, Conn.

1,877,141. September 13, 1932. **Aluminum Casting Alloy.** Alfred J. Lyon, Harshmanville, Ohio.

1,877,208. September 13, 1932. **Process for Preservation of Metal Surfaces.** Charles A. Van Dusen and Louis Haase, Baltimore, Md., assignors to The Glenn L. Martin Co., Baltimore, Md.

1,877,255. September 13, 1932. **Sand Blast Apparatus.** Donald S. Sammis, Stratford, Conn., assignor to The New Haven Sand Blast Company, New Haven, Conn.

18,600. Re-issue. September 20, 1932. **Zinc Base Die Casting Alloy.** Edmund A. Anderson and George L. Werley, Palmerton, Pa., assignors to The New Jersey Zinc Company, New York, N. Y.

1,877,867. September 20, 1932. **Alloy Metal Flux and Process of Making the Same.** Ernest Hey, Bellingham, Wash., assignor to All-Sol Company, Bellingham, Wash.

1,877,896. September 20, 1932. **Die Casting Machine.** Torbjorn C. Korsmo, Madison, Wis., assignor to Madison-Kipp Corporation, Madison, Wis.

1,878,098. September 20, 1932. **Bronzing Machine.** Frank R. Belluche, Racine, Wis.

1,878,240. September 20, 1932. **Fabricating Magnesium.** John E. Hoy, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

1,878,507. September 20, 1932. **Process for the Recovery of Tin Compounds in the Art of Loading Silk.** Walter Meitner, Vienna, Austria.

1,878,532. September 20, 1932. **Inductor Type Furnace.** Edwin Fitch Northrup, Princeton, N. J., assignor to Ajax Electro-Thermic Corporation, Trenton, N. J., a Corporation of New Jersey.

1,878,540. September 20, 1932. **Electrolytic Method of Continuous Sheet Manufacture and Apparatus Therefor.** Gustav A. Reinhardt and Richard H. Eurich, Youngstown, Ohio.

1,878,686. September 20, 1932. **Alloy.** Owen W. Ellis, Toronto, Ontario, Canada.

1,878,761. September 20, 1932. **Process of Coating Metallic Surfaces for Prevention of Corrosion.** John Davies, Waterloo, Liverpool, England.

1,878,837. September 20, 1932. **Method of Preparing Metals for Electroplating.** Arthur F. Francis, Waterbury, Conn.

1,878,840. September 20, 1932. **Cutlery Polishing Machine.** John Fusco, New Haven, Conn.

1,878,918. September 20, 1932. **Manufacture of Chromic Acid.** Marvin J. Udy, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia.

1,878,936. September 20, 1932. **Refining of Copper.** Victor E. Legg, East Orange, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a Corporation of New York.

1,878,939. September 20, 1932. **Production of Metallic Aluminum and Other Materials.** William Junius Lester, Little Rock, Ark.

1,879,076. September 27, 1932. **Metal Casting Machine.** John Carle, Garwood, N. J.

1,879,078. September 27, 1932. **Method of and Means for Forming Tubular Articles.** Carl Carlsen, Youngstown, Ohio.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Diaphragm Valve Lined with Hard or Soft Rubber

American Hard Rubber Company, 11 Mercer Street, New York, has placed on the market a diaphragm valve which is available with hard or soft rubber lining. The valve is the Hills-McCanna Company (Saunders patent) product, with "Ace" rubber protection, for use in handling corrosive liquids.

The company recommends the hard-rubber-lined valve for practically all corrosive work; the soft rubber lining is provided for use where abrasion is a factor. Either type affords complete protection of the working mechanism, it is stated. There is no stuffing box, and diaphragm is supported in all positions.

Rubber-Lined Diaphragm Valve.

The valve is stocked in sizes from 1 to 4 inches. Sizes up to 14 inches are under consideration.

Powdered Metal Polish

The Hull Company, 130 Clinton Street, Brooklyn, New York, offers a new metal polish in powder form, said to be an improved product with patent pending. It consists of silica and suitable emulsifying and stabilizing agents, which is sold in dry form for use after mixing with water. It is sold both to consumers and to people who dissolve and sell it under their own labels as liquid metal polish. It is said to be distinctly superior to other products giving unstable suspensions in naphtha or gasoline, but which are unsuited to water solutions.

Full data on purchase of the product and licenses for resale under pending patents are available to readers directly from the manufacturer.

New Type Soldering Flux

American Chemical Paint Company, Ambler, Pa., has developed "Flosol," a new type of soldering flux for steel and most of the other commonly used metals except aluminum and its alloys. It is a creamy substance which is painted on the surfaces to be soldered, where it may be left to dry before soldering, or soldered immediately. On ferrous metals its advantage is stated to be prevention of rusting, which is very important where soldering must be done. Similarly, it excludes oxidation on nonferrous metals, and fluxes it as well. The film, according to the maker, neither runs nor spreads when heat is applied, and any residue is removable with wet cloth. Advantages claimed include perfect fluxing; low cost; cleanliness and ease of application; absence of corrosive fumes; limited spread and elimination of pits in solder due to entrapped flux; time saving, as it can be applied by unskilled operators rather than solderers; fluxed area is white, easy to see, preventing "misses" in soldering or in final removal of excess flux.

"Flosol" is available in 12 lb. and 60 lb. cans, as well as in small containers for resale.

Special Chemicals Corporation

Lionel Cinamon, chemical engineer, has formed his own company, The Special Chemicals Corporation, 30 Irving Place, New York City, for the manufacture and sale of rhodium plating solution and cleaning compounds, and general consulting service for the electroplating industry.

Mr. Cinamon has had varied experience in the plating and cleaning industries. He has been assistant superintendent at the Bowker Chemical Company, manufacturers of ingredients for cleaning compounds; sales engineer for R. & H. Platinum Works, which is now part of Baker and Company; and head of the technical research and electroplating division of Sigmund Cohn, New York precious metal and rhodium plating solution manufacturers.

Ammeter Measures Current Without Interruption

Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio, offers the "Tong-Test" ammeter for measuring current where it is inconvenient or not permissible to interrupt the circuit. It is said to be easily applied to both direct and alternating current.

The maker states it is a split electromagnet type instrument without windings (see illustration). The laminated magnet yoke is in two parts, with trigger separator.

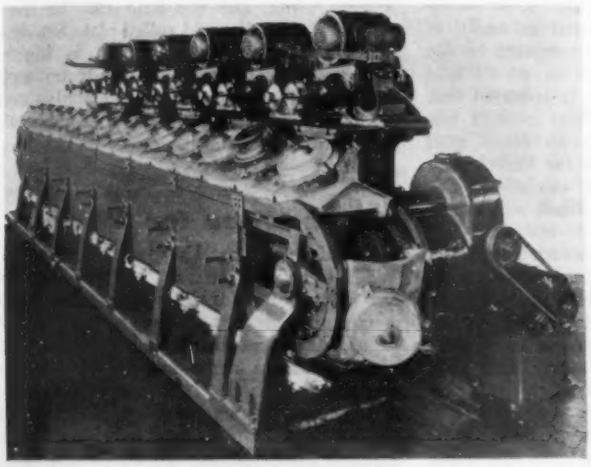
"Tong-Test" Ammeter with Magnet Yoke Held Open by Trigger to Admit Cable.

In use the jaws are spread and passed around the cable in which current is to be measured. Trigger is released and reading taken. No actual connection is required, magnetic flux in line being used. The instrument is stated to be light and operable with one hand. Jaw opening will take cables up to 1⅝ in. diameter. Readings may be taken in D.C. or A.C. circuits, including single-core armored cables used in D.C. lines, and lines run in steel conduits. Interchangeable elements are provided to suit any conditions; 50, 100, 150, 200 and 400 ampere capacities are standard. Other advantages claimed include low cost compared with other types of equipment; no shunts or ratio transformers required; cannot burn out or short circuit; long life.

Continuous Feed Polishing and Machining Units

Sommer and Adams Company, 18511 Euclid Avenue, Cleveland, Ohio, manufactures a line of standard machines, for application to continuous polishing, grinding, machining, automatic welding and similar work on a production basis. The company manufactures units in several sizes, of which various combinations can be arranged to provide for a wide variety of work and also varying capacities.

An interesting application of this equipment is an installation made recently at a plant where automobile hubs are produced.



Sommer and Adams Continuous - Feed Machine Used for Polishing Hub Caps

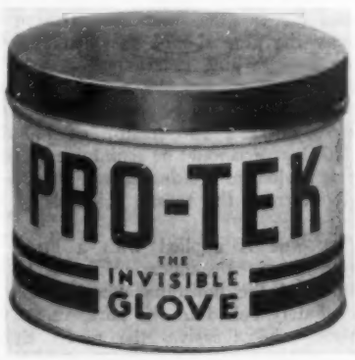
The work is made of two sections which are welded together. The "flash" made by the welding is polished off on the Sommer and Adams machine shown in the illustration here. The feed mechanism is caterpillar type, and the machine has six polishing wheel heads. It is supplied with work by one operator, who loads and unloads. The conveyor is driven by a motor, as are each of the wheel spindles. The spindles on the work carriages are rotated by a sprocket, which engages with a horizontal roller chain as the carriage enters the working plane. The chain is run by a separate motor, and rate of work rotation is varied by changing the sprockets. Polishing units are adjustable to center line of work, and columns carrying the units are adjustable vertically. Work of irregular contour is provided for by means of a counterweighted swivel arrangement whereby the polishing units move in a vertical plane. This also allows for applying wheels on an angle, as required in certain kinds of work. Manual swiveling is provided to aid in wheel changing. The machine can be arranged so that swiveling will be mechanical and automatically in time with feeding in order to reach deep contour cavities.

The number of polishing units are determined in this type of equipment by the speed with which the operator can load and unload it. The equipment is made in several standard frame sizes, with interchangeable carriages, work spindles, columns and wheel heads. It is also possible to have a variation in the carriage whereby three small work spindles would carry three pieces of work at once, rather than a single spindle that holds one piece of work. Standard unit construction permits economical setting up of combinations to suit various types and amounts of production. Among the operations which can be handled are buffing, polishing, grinding, drilling, tapping, milling, welding, broaching.

"Invisible Glove" Protects Hands from Dirt

For years men who work with lacquer, paint, varnish, grease, oil and similar materials have faced a serious problem in cleaning their hands. Some use solvents and harsh abrasives harmful to the skin. Protection from such materials and from use of abrasives is said to be available in Pro-Tek, a new product being marketed by The DeVilbiss Company, Toledo, Ohio. Pro-Tek is a white cream which is rubbed into the skin before work to form a protective film that is soluble only in water and which sticky substances and soiling materials do not penetrate. Pro-Tek is said to be revolutionary in action, the first material that actually prevents dirt and liquid from entering the pores of the skin. Hence its description as an "invisible glove." The maker says Pro-Tek is not only harmless to the skin, but actually beneficial, and leaves no sticky or greasy feeling.

When Pro-Tek is used, lacquer, paint, grease, metallic dusts and similar materials can be quickly and completely removed by washing the skin under running water, it is stated, severe tests having been made in which men have applied Pro-Tek and then dipped their hands in black lacquer and let it dry, or coated their hands with oil, or soiled them with printer's ink. In every case, it is said, the material was easily removed by water. Battery acid, gasoline and naphtha were unable to reach the skin through Pro-Tek. Hence, workers who have always had dry, cracked or stained hands can now keep them soft and healthy through the use of this new material. It is helpful in preventing oil dermatitis and other industrial skin diseases. The material is recommended to industrial finishers, mechanics, platers, cleaners, enamelers, electricians, and workmen in general.



Pro-Tek is said to be priced so that a full day's protection costs less than one-half cent. Complete details can be secured by readers on application to The DeVilbiss Company, Toledo, Ohio.

History of Rubber Lined Industrial Equipment

In a very good article on the subject, H. E. Fritz and J. R. Hoover of the Chemical Sales Division of The B. F. Goodrich Rubber Company, Akron, Ohio, review the development of rubber lined industrial equipment. Beginning with the conception in 1884 by two Goodrich men of the idea of using rubber to line holders and containers for corrosive liquids, the article covers the start of research on methods of joining rubber to metal; the Goodrich development of the "Vulcalock" in 1923, whereby soft rubber is vulcanized to steel in a practically integral union, to form a highly durable and efficient lining for tanks and various other equipment requiring corrosion-proof interiors; the application of "Vulcalock" linings to tank cars, process tanks, blowing and exhaust machinery handling corrosive gases and vapors, chutes carrying highly abrasive materials, drums and barrels, all marked steps in the progress of the use of rubber linings. It eliminated to a great extent the wasteful, inconvenient and unsightly carboy handling of acids. Development of "Triflex" was a further step, and is a method of using combinations of hard and soft rubber in layers where such construction is advantageous. It was also found that brick or timber sheathings help in applications where extreme shock or gouging are encountered, as in dissolving scrap iron in chemical industry, and in steel pickling.

The research continues, and Goodrich is expected to develop further the already wide application of rubber to industrial processes.

Glues for Preparation of Polishing Wheels

Information on the selection and use of glue for preparation of polishing wheels is offered by the Kelsey-Risden Company, 692 Greenwich Street, New York. This is one of the largest glue concerns in the east. It was organized in 1917, and makes a specialty of glues for the polishing trade. John E. Trumbour was recently appointed manager of this department of the business. Their advice on glues for use in polishing follows.

Glue is obtained from various parts of different animals, and upon the method of extracting the "stock," depends to a great extent the quality of the finished product. There are several different kinds of glue, but the best glue for abrasive work is obtained from pure hide stock.

Glue used in the polishing trade are of various colors from a light to a dark brown, and are usually supplied in the form of flakes or ground. The color or the shape of the glue does not necessarily denote the quality of material. High grade glues are of high viscosity.

In selecting the proper glue the character of the work to be polished should be considered, and also the size of the abrasive to be used. The glue should be strong but not brittle, toughness being the desired factor, with a certain amount of flexibility. Having selected the proper grade of glue, it should be soaked in cold water for five to twenty-four hours, depending upon the type of the glue used; ground glue requiring the shorter time, while the flake variety requires the longer soaking time. The amount of water to add for the soaking will depend upon the grade of glue. Usually equal parts by weight of glue and water are used, although the better grades of glue require more water. Then again, it will depend upon what size abrasive is to be used, or how thin the glue should be, for the finer the abrasive the thinner the glue should be when applying it to the polishing wheel.

After the soaking, the glue is dissolved by placing the "glue pot" in the steam heater, where a temperature of 140 deg. to 150 deg. F. should be maintained. Boiling or prolonged cooking should be avoided as it destroys the tensile strength of the glue.

The glue is applied with a brush of proper size in a smooth, even coat to the surface of the polishing wheel, which is immediately rolled in the abrasive. After applying the abrasive, the wheel should be air dried for at least twenty-four hours before using.

High Temperature Alloy

Westinghouse Research Laboratories, East Pittsburgh, Pa., has developed a new alloy, Konal, which is said to retain useful strength at high temperatures, and has successfully replaced platinum alloy as the filament material in many radio tubes. The alloy is a nickel base, with additions of cobalt, iron and titanium. One type is nickel with 18% cobalt, 6% iron and 2.5% titanium. When aged after quenching, this alloy hardens to about 300 Brinell, has tensile strength of 75,000 lbs. per square inch, with elongation of over 20% at 600° C. Its application is said to extend to larger structures as well as vacuum tube construction.

Besides its high strength at high temperatures, the alloy is stated to have excellent resistance to certain corroding media, such as most acids, moist air at elevated temperatures, and moist sulphurous gases.

New 14 Karat White Gold Plating Solution

Development of a new 14 K white gold plating solution which has been standardized and can be operated as easily as a 14 K red gold bath is announced by the Mark Weisberg Laboratories, 80 Clifford Street, Providence, R. I. It is stated that the bath requires no special control and can be operated along with other gold solutions, and can be used for basket plating and such difficult work as chains. The deposit is said to be a brilliant white, and acid proof. The statement continues:

A flash plate from this solution is highly resistant to wear and acid, even more so than a flash plate of a 14 K red gold solution, or a 24 K gold. The deposit is close grained and makes an excellent base for rhodium plating. The color is very near that of rhodium, and as much as a five minute deposit can be given without dulling the plate. Tests have shown that rhodium plated over this white gold plate will stand tarnish and wear considerably more than rhodium plated over nickel.

This white gold solution can be used to plate on all type of metals, including iron and steel, and will also plate over soft solder and other alloys of tin.

Particular advantages claimed for this bath are as follows: It is a cyanide bath, which is self-cleaning; there is practically no chance for poor plating. No special equipment or control instruments are required. Ordinary gold equipment is suitable for this bath. The plate is close grained, practically non-porous, and of excellent white color. The throwing power is good, and the bath can be used for either basket or barrel plating. The color is very white, and the bath can be used for finishing white gold rolled plate articles, or as a base for rhodium. It is highly acid, tarnish-resisting, and stands up well in wear. It is inexpensive to apply, and fills a long-felt need for a good, economical, acid proof white finish.

Deoxidizer for Metals

Metallochemische Fabrik, A.G., Berlin, W50, Germany, offers "Metallophos," a new type of deoxidizer for nonferrous metals, including all copper-base alloys, nickel, German silver, and others. The product, as the name implies, is a phosphorous compound. It is supplied in several grades having varying phosphorous contents. Full information is available from the American agents, Hummel Chemical Company, 90 West Street, New York.

Equipment and Supply Catalogs

Surface Condensers. Ingersoll-Rand, 11 Broadway, New York City. Heavy steam equipment.

Fire Brick. Laclede-Christy, St. Louis, Mo. Bulletin on Laclede Mullite, a new highly refractory fire brick.

Sieves. Newark Wire Cloth Company, Newark, N. J. Bulletin on testing sieves, U. S. and A.S.T.M. standard.

Rust Prevention. American Chemical Paint Company, Ambler, Pa. Bulletin 20, "The Cause and Prevention of Rust."

Arc Welding. Hobart Brothers, Troy, Ohio. New booklets: Manual of Arc Welding; Profitable Uses of Arc Welding.

Belting. The B. F. Goodrich Rubber Company, Akron, Ohio. Booklet, "Lubricated with Rubber," on Highflex belting.

Special Alloys. H. Kramer and Company, 21st and Loomis Streets, Chicago, Ill. Folder on various special nonferrous alloys.

Diaphragm Valves. American Hard Rubber Company, 11 Mercer Street, New York. Bulletin 20A on valves with hard or soft rubber linings.

Welding. Harnischfeger Corporation, 4400 West National Avenue, Milwaukee, Wis. "Weld It Well," a catalog of equipment, with considerable technical data.

Stainless Steels. Electro Metallurgical Company, 30 East 42nd Street, New York. Fine illustrated 20-page booklet giving characteristics and uses of this material.

Colloidal Graphite. Acheson Oildag Company, Port Huron, Mich. Technical paper on "Importance of Colloidal-Graphited Lubricants in 'Running In' Operations."

"Effective Credit Management." Metropolitan Life Insurance Company, New York. A report of policies and practices employed by manufacturers and wholesalers.

Laminated Synthetic Material. Continental-Diamond Fibre Company, Newark, Del. A very comprehensive catalog of "Dilecto" products. Contains a great deal of technical information. 40 pages, illustrated.

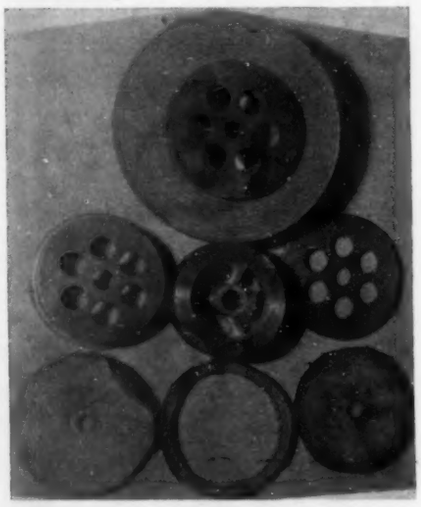
Dust Control. Pangborn Corporation, Hagerstown, Md. Circular on dust collecting equipment. Also, four new bulletins on: Exhausters and Blowers; Centrifugal Dry System Collector; Type "CD" and "CD-1" Collectors; and Dust Collectors (general purpose).

Engineering—A Career, A Culture. Engineering Foundation, 29 West 39th Street, New York. A 62-page booklet containing a message for young men, parents and teachers. Describes the engineering professions. Sold for 15 cents a copy, with discounts for quantities.

New Hub for Buffing and Polishing Wheels

A new device for improvement of efficiency of soft wheels used for buffing and polishing metals is offered by J. Steiner Buffs, Inc., Hyde Park, N. Y. It consists of a 7-inch aluminum reservoir hub which is placed on the spindle of an ordinary polishing lathe. The sectional cloth wheels used can be of the usual material, but must have a 7-inch hole in place of the usual spindle-size hole. The wheel sections are placed over the patented hub, and special flanges are tightened on either side by the regular spindle nut. The hub is of hollow construction, permitting it to be filled with water. The reservoir is perforated. As the wheel becomes hot from friction in use, the water is drawn out of the hub into the cloth wheel and cools it. A wrapping of felt prevents dripping out when wheel is not revolving, and undue loss by centrifugal force when in motion.

J. Steiner, inventor of the hub, claims several advantages for this method. He states that the use of buffs of ordinary construction but with a 7-inch hole reduces the cost considerably by cutting down the weight, and a further saving is effected by large reduction in waste when buffs are worn down to less than the diameter required to maintain the necessary peripheral speed. The water cooling system, increases the life of the wheel, he claims, since it is his opinion that buffing wheels are seriously injured by frictional heat.



New Type Hub for Polishing Wheels

At Top, an Assembled Wheel. Center Row, Parts of the Hub. Bottom, Worn Out Wheels, Showing Usual Amount of Waste at Left and Right, and, in Center, Small Waste Claimed for Type of Buff Used with Steiner Hub

---

COMPLETE INFORMATION on any of the products described on this and preceding pages is available to readers on application to the respective companies. Please mention METAL INDUSTRY in such communications.

Personals

Dr. Irving Langmuir

The Nobel Award in Chemistry for 1932, the greatest recognition that any scientist can receive, will be presented to Dr. Irving Langmuir, associate director of the General Electric Research Laboratory, Schenectady, N. Y., in Stockholm on December 10, 1932.

The Nobel award is a distinctive honor among many previous honors Dr. Langmuir has earned. The Nichols medal has been awarded to him twice by the New York section of the American Chemical Society—in 1915 for his work on chemical reactions at low pressures, and in 1920 for his work on atomic structure. He received, in 1918, the Hughes medal from the Royal Society of London in recognition of his researches in molecular physics. The American Academy of Arts and Sciences in 1920 awarded him the Rumford medal for his thermionic researches and his gas-filled incandescent lamp. The Royal Academy of Lincei, at Rome, Italy, in 1925 bestowed upon him the Cannizaro prize; in 1928 he was recipient of the Perkins medal; and in 1930 the Chandler medal. This year the Popular Science Monthly awarded him its annual medal and honorarium of $10,000 as an American who had done notable scientific work.

He is a past-president of the American Chemical Society, is a member of various scientific societies, and has received numerous honorary degrees.

Dr. Langmuir became affiliated with the General Electric Research Laboratory in 1909. His achievement which stands first in chronological order is also regarded as the most significant in a practical sense—the development of the high-intensity incandescent lamp, the bulb of which contains small quantities of either nitrogen or argon. This discovery made possible immense savings to the American people in the cost of electric lighting. More than half the electric current utilized for light is consumed in high-intensity illumination, and the cost of energy thus applied was reduced 50 per cent by Langmuir's gas-filled lamp. The saving in terms of cash amounts to a million dollars a night.

Growing out of his work with the incandescent lamp came momentous discoveries affecting the then new and somewhat immature vacuum tube. Langmuir's discoveries produced vacuum tubes far more powerful and effective than any previously known, and made possible the vast development of radio broadcasting as well as the entry of the vacuum tube, through the work of others, into electrical control operations and other fields.

Equally important was his discovery of the new process of electric welding by the atomic hydrogen method. This process permits the welding of metals which formerly could not be joined, and the welds are of the highest quality, without the slightest trace of oxidation. The method consists of the passage of a stream of hydrogen through an electric arc, the heat of the arc disintegrating the hydrogen molecules into atoms, which recombine beyond the arc into molecules, and in so doing liberate an enormous heat.

Dr. Langmuir was born in Brooklyn in 1881; in Brooklyn he studied at Pratt Institute; he was graduated from the School of Mines of Columbia University in 1903; received his master's degree and that of doctor of philosophy at the University of Goettingen, Germany; and was instructor in chemistry at Stevens Institute of Technology from 1906 until 1909, when he joined the research staff of the General Electric Company.

Dr. IRVING LANGMUIR

Dr. Willis R. Whitney

Dr. Willis Rodney Whitney, organizer and for 32 years director of the General Electric Company's research laboratories at Schenectady, N. Y., retired from active service November 1, owing to poor health. He will continue as vice-president in general charge of research. He is succeeded as active head by **Dr. William David Coolidge,** who is senior associate director. Dr. Whitney left an instructorship at Massachusetts Institute of Technology in 1900 to head the then newly established G. E. research laboratory. Among his associates from the start was the late Dr. Charles P. Steinmetz. In 1906 Dr. Coolidge, also previously at M.I.T., came to the laboratory, and in 1909 Dr. Irving Langmuir was persuaded to come from Stevens Institute of Technology (see above). Among the achievements of the laboratory were many notable improvements in incandescent lighting, drawn or ductile tungsten, improved X-ray tubes, atomic hydrogen welding. The original laboratory was an old barn where Drs. Whitney, Coolidge and Steinmetz did their early work for G. E. By 1920

the laboratory had 300 on its staff and an elaborate building. In 1925 a new six-story building was provided to house it.

H. G. Keshian, metallurgist, Chase Companies, Inc., Waterbury, Conn., has been elected for a two-year term as a director of the American Society for Steel Treating. **H. D. McKinney,** vice-president, Driver-Harris Company, Harrison, N. J., has been elected a director also.

Thomas W. Pangborn, president of Pangborn Corporation, Hagerstown, Md., manufacturers of sand blast equipment, has been elected vice-president of the National Founders Association.

Walter F. Perkins, works manager of the Worthington Pump and Machinery Corporation at Harrison, N. J., since 1927, has resigned to become vice-president and general manager of The Bartlett Hayward Company, Baltimore, Md., December first.

William H. Fallon, formerly with Maas and Waldstein Company, Newark, N. J., has joined the H. V. Walker Company, Elizabeth, N. J., manufacturers of lacquers, enamels and allied products. Mr. Fallon will represent the Walker company in the New England territory.

Obituaries

Samuel E. Huenerfauth

Brief mention was made here last month of the sudden death on October 28, 1932, of Samuel E. Huenerfauth, president and treasurer of Crown Rheostat and Supply Company, Chicago, Ill. A review of the life of this leader in the finishing equipment and supply industry follows.

Samuel E. Huenerfauth was born on July 30, 1866, at Pomeroy, Ohio, where he received his education and started on his business career.

In 1887 he went to Mansfield, Ohio, as

SAMUEL E. HUENERFAUTH

an inspector for the Bell Telephone Company. Later he became manager for that company at Newark, Ohio. In 1890 he was appointed superintendent of the Mansfield Electric Light and Street Railway Company. In 1894 he became associated with the Phoenix Electric Company, where he remained until 1903, when he helped to organize the Ideal Electric and Manufacturing Company, Mansfield, to manufacture an extensive line of electrical apparatus.

In 1910 Mr. Huenerfauth sold his interest in the Ideal Electric Company to accept a position with the Bennett-O'Connell Company, Chicago, Ill., and remained with that firm until 1914, when he organized the Crown Rheostat and Supply Company, Chicago, of which he was president and treasurer until his death. This company rapidly attained a leading position in the field of electroplating and finishing equipment. This success is evidence of the founder's business ability, his improvement of his opportunities, and his well directed energy.

On October 28 he dined with his family at the Chicago home of his daughter. Shortly after dinner he suffered a heart attack and passed away. After funeral services at Chicago the remains were taken to Mansfield, Ohio, for burial.

Mr. Huenerfauth is survived by his widow, Laura Collingwood Huenerfauth; two daughters, May Callan and Grace H. Morper; and a son, George Edward Huenerfauth, who has been connected with his father's firm for a number of years.

David Long Summey

David Long Summey, consulting engineer for the United States Metals Refining Company, New York City, died at his home in that city on November 14, 1932, aged 57. Born in Davison, Mich., he studied at the University of Illinois and early became associated with the United Gas Improvement, Philadelphia, Pa. From 1905 to 1913 he was a designing mechanical engineer, specializing in extrusion processes, at The Chase Companies, Inc., Waterbury, Conn. From 1913 he continued his work on extrusion at the Scovill Manufacturing Company, Waterbury, and later became chief engineer of that company. About five years ago he was engaged as a consultant by the United States Metals Refining Company, to design an electric melting furnace as the first step in the development of a process for producing oxygen-free copper of high electrical conductivity. At the Carteret, N. J., plant of this company the process he developed is now successfully producing such copper on a commercial scale.

Mr. Summey is survived by a widow and three children.

August Mainz

August Mainz, 58, for the past 20 years foreman for the Atlas Foundry Company, Detroit, Mich., died of a paralytic stroke while at work recently.

S. D. Benoliel

S. D. Benoliel, founder and general manager of the International Chemical Company, Philadelphia, Pa., died of heart failure on November 23, 1932. He was 58. Mr. Benoliel, who was one of the most widely known and respected men in the industrial cleaner industry, was born June 1, 1874, in New York City. During his career he was, from 1901 to 1906, general manager of Roberts Chemical Company, Niagara Falls, N. Y. (now the Niagara Alkali Company). He founded his

S. D. BENOLIEL

own company in 1906, and was its general manager up to his death last month. (A more complete biography will appear here later.)

Mr. Benoliel is survived by his wife, a daughter, and two sons.

Frank J. Gorse

Brief mention was made here recently of the death of Frank J. Gorse on October 1, 1932. He was assistant treasurer of Scovill Manufacturing Company, Waterbury, Conn.

Mr. Gorse was born in Brooklyn, N. Y., in 1862. He went to the Scovill Company at eighteen, and for the remaining fifty-two years of his life he remained with the

company. He rose steadily and became assistant treasurer in 1920.

A Scovill official, speaking for the company, says that "his career, which was marked by assiduous attention to duty and a precise rectitude in all his relations, was illustrative of the traditional American experience of starting at the bottom and working well up toward the top. He began his work at the company as an office helper, and was advanced to office positions of increasing responsibility, this bringing him into close association with the administrative officers of the organization, such as the late President Mark L. Sperry, and the late Treasurer Clayton M. DeMott.

"His experience with the company during the half century of his association was one fraught with the most interesting and exacting problems of office routine incident to the notable growth of the company from a concern of less than one million dollars capital and surplus to the present twenty-five million dollar corporation. The period included, furthermore, the ever-memorable industrial exactions of the company's production for the United States and the Allies during the World War.

"Mr. Gorse was simple and unpretentious in his personal and social interests, his membership in the Waterbury Club and Waterbury Country Club being hardly more than formal, and his closest interests being centered in his relationship with the First Methodist Church of Waterbury, which he served on the official board, as trustee, and on various committees. He justly enjoyed the esteem of all with whom he had been associated in his business and social connections."

Henry Weyand

Henry Weyand, aged 67, of Waterbury, Conn., president of the Lux Clock Company, president and treasurer of the Henry Weyand Company, sheet metal manufacturers, and president of the former Merchants Trust Company, all at Waterbury, died at his home there on November 3, 1932.

Mr. Weyand was born in Prussia and came to Waterbury in 1882. He incorporated the American Sheet Metal Company in 1904, but later sold it and established the Henry Weyand Company. He was one of the organizers and one of the largest stockholders in the Lux Clock Company, and became its first president. He is survived by his wife and three sons.

W. R. B.

Frank L. Squires

In the last issue we reported briefly the death on September 28, 1932, of Frank L. Squires, treasurer of the Waterbury Farrel Foundry and Machine Company, Waterbury, Conn. Mr. Squires, who was 45, died after a few days' illness following a heart attack.

Frank L. Squires was a native of Waterbury and one of its best known citizens. He was educated there, joined the Waterbury Farrel company as a young man, and spent his entire business life with the concern. After various clerical positions he was made purchasing agent, then elected assistant treasurer, and, in 1930, treasurer and a director. He was highly regarded for his business abilities.

Besides his business, Mr. Squires was just as well known for his social, fraternal and philanthropic activities. He was concerned with the welfare of his city and state in general, and served in numerous capacities at considerable personal sacrifice. He was especially interested in the Boy Scouts, the Y. M. C. A., the Kiwanis Club, the Sons of the American Revolution, and a number of philanthropic organizations. He was also a devotee of more than ordinary capacities in golf, volley ball and gymnastics. Generous and sympathetic in nature, he will be remembered as one of Waterbury's most distinguished men.

Lewis H. Jones

Lewis H. Jones, for many years a conspicuous figure in industrial circles, died Thursday, October 27, at his home in Grosse Point Farms, near Detroit. Up to the time of his retirement a few years ago, he was president of the Detroit Copper and Brass Rolling Mills. At the time of his death he was a bank director and identified with other business interests.

F. J. H.

Louis Lowenstein

Louis Lowenstein, 47, president of Lowenstein Metals Corporation, Brooklyn, N. Y., a member of the secondary nonferrous metals trade since 1898, died of heart failure in November. He had been identified, during his career, with his father's firm, O. Lowenstein, New York; Nassau Smelting and Refining Works, New York; Tottenville Copper Company, Staten Island, N. Y.

John C. Hollands

John C. Hollands, 70, for the past 48 years connected with Griswold Manufacturing Company, Erie, Pa., in a sales capacity, died October 18, 1932, at his home at Westfield, N. Y., the city in which he was born.

William H. Barker

William Harding Barker, 92, for more than 60 years associated with Ripley Howland Manufacturing Company, Boston, Mass., manufacturing jewelers, died at Wollaston, Mass., last month.

John C. Hollands

John C. Hollands, 70, for the past 48 years an executive of Griswold Manufacturing Company, Erie, Pa., aluminum products, died a short time ago.

News of Associations

American Electroplaters' Society

Research Fund

Contributions to the Research Fund of the American Electroplaters' Society from October 1 to November 26, 1932, amounted to $915. The contributors during that period were:

Dayton Branch, $50; Kay & Ess Co., Dayton, Ohio, $25; Udylite Process Co., Detroit, Mich., $50; Pittsburgh Branch, $56; Bethlehem Steel Corp., $100; Matchless Metal Polish Co., Chicago, Ill., $50; Standard Sanitary Mf'g. Co., Pittsburgh, Pa., $50; Toronto Branch, $50; International Silver Co., Meriden, Conn., $100; Sargent & Co., New Haven, Conn., $50; E. J. DuPont de Nemours & Co., Phila., Pa., $25; Anderson Branch, $52; Newark Branch, $32; McGean Chemical Co., Cleveland, Ohio, $25; C. L. Van Derau, Mansfield, Ohio, $10; International Fellowship Club, New York, $50; METAL INDUSTRY, New York (Advertising space), $70; BRASS WORLD, New York (Advertising space), $70.

It is again desired to point out that the Research Fund is used for the purpose of carrying on research work in electroplating, mainly in collaboration with the United States Bureau of Standards. The Society urges all companies and individuals interested in the progress of the electroplating and related industries to contribute to the Fund and make possible the continuance of the research on which so much of the future of the industry depends.

Subscriptions may be sent to the Secretary-Treasurer of the Research Fund, Walter Fraine, 507 Grand Avenue, Dayton, Ohio, or to any of the following officers and members of the committee:

Jacob Hay, Chairman, 18004 East Park Drive, Cleveland, Ohio.

W. M. Phillips, Vice-Chairman, R. F. D. No. 1 Hunt & Southfield Rd., Birmingham, Mich.

Dr. Wm. Blum, Bureau of Standards, Washington, D. C.

Dr. A. K. Graham, 34th and Spruce Sts., Philadelphia, Pa.

Dr. O. P. Watts, 114 Spooner St., Madison, Wis.

Walter S. Barrows, 628 Doverscourt Rd., Toronto, Ont., Canada.

E. J. Musick, 206 S. Ninth St., St. Louis, Mo.

M. D. Rynkofs, 1350 W. 25th St., Los Angeles, Cal.

O. J. Sizelove, 919 Chancellor Ave., Irvington, N. J.

RESEARCH COMMITTEE, A.E.S.

International Fellowship Club Aids Research Fund

The International Fellowship Club, organization of electroplating and metal finishing equipment and supply sales representatives has contributed $50 to the Research fund of the American Electroplaters Society, according to Thomas A. Trumbour, secretary of the Club. The action was taken after a conference between C. L. Van Derau, president of the A. E. S., and Mr. Trumbour, who in turn consulted the present and the past officers of the Fellowship Club, all of whom concurred in the action.

The present contribution to the Fund is in addition to the customary annual Fellowship Club donation, which for the past two years has amounted to approximately $100 a year.

Founders' Association

National Founders' Association, 29 South La Salle street, Chicago, Ill., held its 36th annual convention November 16-17, at New York. Papers were heard on a variety of economic and industrial subjects.

S. Wells Utley was re-elected president; Thomas W. Pangborn of Pangborn Corporation, Hagerstown, Md., was elected vice-president, and J. M. Taylor was re-elected as secretary-treasurer, having heretofore been secretary. A. E. McClintock continues as commissioner.

American Zinc Institute

Exhibits of "Seal of Quality" sheets for the winter months, as thus far arranged, include the following:

Nov. 12-19, American Royal Livestock Show, Kansas City, Mo.; Jan. 11-13, New York State Horticultural Show, Rochester, N. Y.; Jan. 16-20, Pennsylvania Farm Show, Harrisburg, Pa.

Acetylene Association

The 33rd Annual Convention of the International Acetylene Association will take place at Philadelphia, November 16, 17 and 18. Headquarters of the association are at 30 East 42nd street, New York.

Metallizing Association

International Metallizing Association was formed recently at Los Angeles, Calif., electing L. E. Kunkler of Metallizing Company of America, Inc., Los Angeles, president. The organization was formed on the occasion of a gathering of more than 50 engineers representing various branches of the metal industries, who came to see a demonstration of a new process of spraying molten metal over metal or nonmetallic surfaces by means of a gas-heated spray gun. At the meeting Mr. Kunkler explained the development of the metallizing process over the past twelve years. He stated that it has now been perfected for general commercial use with almost any metal as a spraying agent, and for application to almost any type of surface, including fabrics, glass, metals, paper, wood, plastics, cements, etc.

Research in metallizing will be continued however, in order to develop new uses for the process. Charles Boyden has been retained by the association to carry on this work. R. S. Jensen, secretary, will handle news of developments by users of the process, such developments to be made available to all members.

Membership is open to all firms and persons actively entering the metallizing field, while the facilities of the association are free to all interested parties. Headquarters are in care of R. S. Jensen, 1218 Long Beach Avenue, Los Angeles, Calif.

At Right—Charles Boyden, Research Engineer of the Metallizing Association, Spraying an Iron Casting with Aluminum as R. S. Jensen, Secretary, Looks On.

American Electro-Platers' Society

Executive Committee, 1933 Convention, Chicago

F. H. HANLON
General Chairman

C. S. TOMPKINS
General Secretary

All communications regarding the convention should be addressed to the general secretary, at 6916 Clyde Avenue, Apt. 303, Chicago, Ill.

CHICAGO AS AN INDUSTRIAL CENTER

Chicago presents a greater variety of activities than almost any of the other great industrial cities of the United States. Being situated as it is geographically makes it a great natural distributing center for all products, many of which are manufactured here. There are in the Chicago area over 10,000 manufacturing plants and statistics show about 350 distinct classes of products manufactured in Chicago.

Meat packing is, of course, the largest single industry. Printing and publishing is next in line, followed by electrical machinery, foundry and machine shops, men's clothing, and iron and steel. The value of the manufactured products of these six classes is in excess of one hundred million dollars a year.

Other leading products comprise plumbers' hardware, farm machinery, telephone equipment, furniture (metal and wood), household electrical and gas appliances, lamps, band instruments, pianos, radio, auto accessories. railway cars, hardware specialties, wallpaper, calculating machines, electric refrigerators, binding twine, barber chairs, stoves and ranges, electrical signs, shoes, shade-cloth, structural steel, screw machine products, jewelry.

It is interesting to note that there are over 100 job plating shops in the city proper.

It is thus very evident that Chicago presents a wide variety of endeavors in the industrial world, and is not confined to any particular line of manufacture. Another fact that tends to make Chicago a great center of industrial activity is its shipping facilities. Practically every large industrial plant in the United States has offices and warehouse stocks in Chicago.

The Century of Progress Exposition will demonstrate the industrial progress of the world. Every industry will be represented, and there will be no duplication of exhibits. By that we mean that line of operation, as, for example, the assembly of automobiles or testing of materials, will not have a duplication in the entire exposition. The progress of industry, science, medicine, chemistry, agriculture, dairying, etc., will be demonstrated by actual working models.

The convention committee which will be waiting to serve you will have all information available, so that you may find the different classes of exhibits in which you will be interested with a minimum of effort.

The completeness and educational value of the Century of Progress Exposition, as it is planned and being executed, is beyond words. No such graphic representation of the world's scientific and industrial progress has ever been conceived.

The Chicago Branch has plans for your entertainment and instruction which will make the 1933 Convention of the A. E. S. one that will repay any sacrifice necessary to attend. The location of the headquarters at the Congress Hotel makes it ideal for all activities scheduled in the program.

Have you started that Convention Savings Budget? If you knew what is waiting for you n Chicago, June 27, 28, 29, 30, 1933, you certainly would spare no effort to be on hand when the bell rings.

The slogan of the City of Chicago is: "I WILL!" There is no chance of a suit for infringement if you also adopt it. Just say positively "I will attend the Chicago Convention," and—

"We'll be seein' you."

1933 CONVENTION COMMITTEE.

Industrial and Financial News

Ajax and Westinghouse in Furnace Patent Tie-Up

The Ajax-Northrup high frequency or coreless induction furnace has been used principally for melting and refining metals, especially steel. Its use for heating steel shapes either with continuous motion of the piece to be heated or with batch type furnaces offers a large field for this type of electrical heating. The Ajax Electrothermic Corporation, Trenton, N. J., in order to stimulate the growth of its industry, has licensed the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., to make high frequency or coreless induction furnaces or heaters for certain applications in the field of heating.

Ajax has received a license from Westinghouse to use certain patents of the latter company. It is expected that this new tie-up will stimulate development of the high frequency or coreless induction furnace for the industry.

Conference on Welding

The eighth annual conference on welding will be held at Purdue University, Lafayette, Indiana, December 8-9, 1932, under the direction of the Engineering Extension Department and the Department of Practical Mechanics, with manufacturers of welding equipment co-operating. This meeting will consist of exhibits, demonstrations, and talks of interest to users of electric or gas welding in manufacturing, maintenance and repair operations. Anyone interested in welding is invited. There will be no registration fee. Address inquiries to Engineering Extension Department, Purdue University, Lafayette, Indiana.

New Federated Metals Corporation Organized

American Smelting and Refining Company, New York, which recently acquired Federated Metals Corporation, New York, has dissolved Federated, and a new company of the same name has been organized with nominal capitalization, all shares being owned by the American Smelting.

B. Lissberger was elected board chairman, Ivan Reitler president, Edgar L. Newhouse, Jr., executive committee chairman, J. C. Emerson vice-president and treasurer, and George A. Brockington secretary.

Metal Developments

CADMIUM-COPPER and PHOSPHOR BRONZE wires were used in cables for a new 132,000-volt transmission line across the Thames in England. Strength of the cables made possible savings through reduction in height of suspension towers.

DEPOSITION of metals by electrochemical action was performed by the Egyptians 5,000 years ago, according to Dr. Colin G. Fink of Columbia University. He discovered that copper vases of that time were coated with antimony, and deduced that they dipped the vases in solutions of antimony sulphides, salt and vinegar, achieving results akin to modern electroplating.

Brass Ingot Statistics

Non-Ferrous Ingot Metal Institute, Chicago, Ill., reports average prices per pound received by its membership on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending November 4 as follows, with which we supply comparative prices reported for the period ending October 7:

	Month Ending Nov. 4	Month Ending Oct. 7
Commercial 80-10-10 (1% Impurities)	6.971c	7.125c
Commercial 78%	5.128c	5.507c
Commercial 81%	5.492c	5.750c
Commercial 83%	5.704c	6.021c
Commercial 85-5-5-5	6.027c	6.267c
Commercial No. 1 yellow	4.710c	4.735c

The combined deliveries of brass and bronze ingots and billets by the members of the Institute for the month of October amounted to 1,969 tons, compared with 2,112 tons in September.

On November 1 unfilled orders for brass and bronze ingots and billets on the books of the members amounted to 17,002 net tons, as against 18,336 net tons October 1.

Corporation Reports

Net profits or losses for third quarter of 1932 were reported as follows, with comparative figures for same 1931 period in parentheses:

Profits

Parker Rust Proof Company, Detroit, Mich.: $1,981 ($77,996).

New Jersey Zinc Company, New York: $516,330 ($778,817).

Reynolds Metals Company, Louisville, Ky.: net income for first 9 months, $772,627 ($1,259,179 same 1931 period).

Losses

Revere Copper and Brass, Inc., New York: $558,990 ($439,614).

International Nickel Company, New York: $199,097 ($629,327 second quarter 1932).

International Silver Company, Meriden, Conn., and subsidiary: $416,931 ($148,578).

Yale and Towne Manufacturing Company, Stamford, Conn.: $199,686 ($171,254).

Anaconda Wire and Cable Company, New York: $372 992 ($50,061).

Langbein Is Foreign Agent for Bullard-Dunn Process

The Langbein-Pfanhauser-Werke, Leipsig, Germany, long recognized as authorities in the field of electrodeposition and cleaning of metal surfaces, has concluded an agreement with The Bullard Company, Bridgeport, Conn., under the terms of which they are to introduce the Bullard-Dunn metal descaling process in Great Britain and in Continental Europe. It is stated that careful tests made in the research laboratories of the Langbein company proved that the Bullard-Dunn electrochemical method removes every trace of oxide and scale from metal surfaces without the slightest damage to the surface of the metal; also, that the outstanding economy of this process was confirmed.

British Plant for Bristol

Bristol Company, Waterbury, Conn., instrument manufacturer, has established a factory at London, England, known as Bristol's Instrument Company, Limited. It consists of a new 2-story factory building, and an office building. Plant is equipped with all necessary machinery and tools, and full staff of trained British instrument makers, and is prepared to manufacture the full Bristol line of indicating, recording and controlling instruments.

Although the general expansion program of the Bristol Company contemplated the founding of a British plant at some future time, the altered economic and business situation within Great Britain made an earlier establishment for manufacturing in that country seem advisable, it was stated.

Incorporations

Lead Alloy Products Company, 6620 Walton Street, Detroit, Mich.; gaskets, metal products, tools; operate smelting and refining, rolling and stamping departments; by **L. A. Weil.**

Shanklin Manufacturing Company, Springfield, Ill.; to expand and operate metal products concern of same name; operate cutting-up, spinning, stamping, tinning, soldering, plating, polishing, lacquering and japanning departments; by **R. A. Bussien** and **T. R. Meredith.**

Antaciron, Inc., Wellsville, N. Y.; manufacture improved acid-resisting iron castings. **J. H. Ballard** is secretary-treasurer.

American Copper Company, 10 South Wabash Avenue, Chicago, Ill.; aluminum, copper and white metal alloys; by **J. H. Hicks** and associates.

Acme Battery, Inc., Los Angeles, care of **George Appell,** Garfield Building; storage batteries and equipment; by **L. B. Robinson, H. B. Hammond** and **A. E. Holland** of Los Angeles.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

DECEMBER 1, 1932.

Scovill Manufacturing Company has hired back in the past two months over 100 men who for many months, and in some cases for more than a year, had been on the Mutual Aid unemployment list. It is believed that **American Brass Company** and **Chase Companies, Inc.**, have also hired back some former employes.

Bristol Company, manufacturers of recording instruments, announces the establishment of a factory in London, England. (See page 491.)

George L. White, president and treasurer of the **L. C. White Company,** who died recently, left an estate of $255,369.

Among patents granted local inventors last month were the following: **Herman Koester,** paper stretch tester; **John E. Pracny,** machine for making cap screw blanks; **Joseph W. Dews,** snap fastener. W. R. B.

Connecticut Notes

DECEMBER 1, 1932.

HARTFORD — Royal Typewriter Company has brought out another new portable machine called the "Royal Signet," according to **Vice-President C. B. Cook.** It has a standard keyboard, and is much lower in price than most portables. Since July Royal's employment has increased and production of the latest model is expected to result in further gains.

Underwood Elliott Fisher Company reports net loss of $305,812 for September quarter.

Colt's Patent Firearms Manufacturing Company voted the usual dividend of 25 cents a share, payable December 31.

Arrow-Hart and Hegeman Electric Company has a plan by which employes are to contribute to the Community Chest and the corporation is to match the total up to $2,500.

NEW BRITAIN—As a result of a meeting called by **George T. Kimball,** president, **American Hardware Company,** most of the factories here will cooperate with their employes in establishing a fund similar to the Mutual Aid fund of Waterbury, employes contributing a certain percentage of their wages weekly, and their employers matching it with contributions from their treasuries. **William M. Harris** of Waterbury, founder and director of the Mutual Aid there, came here last month and started the plan.

Landers, Frary & Clark is extending its line of production, formerly restricted to the household field, by going into commercial lines, such as the lunch counter and restaurant trade, with beverage mixers, fruit juicers, bread toasters, automatic coffee makers, electric ranges, etc.

Stanley Works has introduced a new item in its line of spring wind steel rules.

MIDDLETOWN—James H. Rand, president, **Remington Rand, Inc.,** says October showed the third consecutive monthly gain in sales, totaling 60% above the summer low point. Company added 440 employes in October and 3,000 in September in all plants, and expects to have all operations at 80% of capacity by February 1.

There has been a 30% employment gain in the last three months, **President T. Macdonough Russell** of the **Russell Manufacturing Company** reports.

Welker-Hoops Manufacturing Company, makers of automobile accessories and novelties, has dissolved its corporate existence but operations will be continued at the Williams Street factory under the name of the **Vitascope Corporation.**

NEW HAVEN — Marlin-Rockwell Corporation and subsidiaries reports net loss of $63,652 for the quarter ending September 30.

BRISTOL — E. Ingraham Company, clocks, is operating its wood-working department on a 24-hour schedule, and other departments are on full time.

TERRYVILLE—A section of the die department of **Eagle Lock Company** has started on a schedule of 10 hours a day, five and one-half days a week. For some weeks it has been on a 30-hour schedule.

STAMFORD — Yale and Towne Manufacturing Company reports a net loss of $199,686 for the September quarter.

PLAINVILLE — President Henry S. Washburn of **Plainville Castings Company** reports increased orders. He says it shows machine-tool makers within a 50 mile radius are increasing production.

J. N. Nelson, manager, **Standard Steel and Bearings Company,** says that both September and October showed large increases over July and August.

Peck Spring Company has been at capacity production for several weeks, according to **Don Peck,** president. Oil burner screw machine departments have been doing some night work.

CHESHIRE—Cheshire Ball and Socket Company is on full time in all departments the first time in three years, and has sufficient unfilled orders to continue on present schedule several months, due to demand for buttons.

BRIDGEPORT—Employment in 30 industrial plants here during October showed an increase of nearly 100 over September, with the largest total employed since June. Past three months' gain has been 366. W. R. B.

Western Massachusetts

DECEMBER 1, 1932.

While there has been an increase in the number of men employed in the 26 metal working plants in western Massachusetts in each of the past two months, November has been rather quiet as far as the employment of additional hands is concerned. Manufacturers apparently are awaiting developments in Washington, and do not wish to plunge too heavily until they have an idea of what may happen in the Capital.

Machine tools remain about the same as last month, with more or less skeleton forces working, although the number of men reporting for work daily is larger than it has been for some time.

Production of a new unit at the **United American Bosch** plant in the radio division is fairly well under way, and it is expected that this section of the plant will show some improvement in the near future.

Westinghouse production showed little tendency to increase noticeably last month, but officials at the plant are confident that increased orders are in the offing.

Business at the **Cheney-Bigelow** wire works is comparatively quiet at present, but the firm remains optimistic. Orders increased slightly last month.

Rolls Royce officials report business is on the upgrade. They expect a considerable increase in business during the next four months, but as yet the increase has not been very pronounced.

Middle Atlantic States

Central New York

DECEMBER 1, 1932.

Employment and working hours in Utica metal plants increased during October, according to charts compiled by the Industrial Association of Utica. Employment averaged 58.8% of "normal" against 55% the preceding month. Hours worked during October were 73.3% of "normal" against 70.9% during September.

Utica Cutlery Company, which is now working nights in some departments, has begun manufacture of spark plugs. It is in a position to make 2,000 a day when demand arises. The plug is named "Silver Gun Shot," silver being used in the contact points, which company officials say is a new departure. Company also has substantial orders for cutlery. Brass linings are used in practically all the better grade of knives, **Walter Matt,** assistant treasurer, reports.

Charges by Democrats that **Remington**

Arms at Ilion attempted to force its employes to vote for Hoover were denied by **Grover C. Radley.**

Part of **Savage Arms Corporation** plant is to be used by **Universal Pressing Machine Company, Inc.,** which is moving to Utica from Oswego. The sales force of the Savage group will sell the pressing machine as part of the Savage line, which includes firearms, a dry cleaning unit, washing machines and mangles.

Standard Brass Manufacturing Company, Utica, reports business is "about the same, without any signs to show the future trend."

Bossert Corporation, Utica, is working on an order for electric percolators. This company specializes in stamping out large and small parts in all metals, and reports good fall business.

American Emblem Company, New Hartford, is displaying its full line of silver, nickel and other types of emblems, badges, watches and novelties at Hotel Martin this month. E. K. B.

Trenton, New Jersey

DECEMBER 1, 1932.

There has been a little improvement in the metal industry in Trenton during the past month, and this is encouraging to manufacturers. Some of the plants at Carteret and Spotswood have increased their working forces. With election over, manufacturers believe there will be a change for the better.

Work has been started on a $55,000 addition to the plant occupied by the **Sun Tube Corporation** at Hillside, N. J., which is to be completed February 1. The addition will be two stories high and 128 feet long. The corporation has been at Hillside seven years. It makes collapsible tin tubes for toilet preparations. The company has been comparatively busy throughout the depression and is now working on an overtime basis.

Igoe Brothers, 234 Poinier Street, has let a contract for a one-story building, 90 by 225 feet, brick and steel, to be used as a wire mill. The building will cost $28,500. C. A. L.

Newark, New Jersey

DECEMBER 1, 1932.

Commercial Hardware Company, Inc., 154 Park Avenue, East Rutherford, has let a contract for a two story and basement, factory building, brick and steel, to cost $28,500.

Newark concerns, recently incorporated: **Tape-O-Matic Machine Company;** manufacture machine appliances; $100,000 capital. **Newark Battery Sales Corporation;** batteries; $100,000. **Machinery Exchange of New Jersey;** foundry; 2,500 shares no par. **Standard Iron Works;** manufacture metal structures. —C. A. L.

Middle Western States—Pacific Coast

Detroit, Michigan

DECEMBER 1, 1932.

With the national election over and the old year's disappointments drawing to a close, industrial leaders are expressing confidence concerning the future. No one expects much change until after January 1, but a much better feeling prevails.

Production in the nonferrous metals lines is no better. The motor car industry is preparing for new models to go on the market in the near future, but it probably will be some time before actual production is started.

Refrigeration and air conditioning manufacturers continue to make progress and are coming to the end of the year with much in their favor. Many plants have been in production most of the summer and fall, and prospects are encouraging for the new year.

Producers of plumbers' and steamfitters' supplies are in light production. Nevertheless everyone is optimistic so far as the future is concerned.

Little change has developed in the plating industry. This, however, will improve when other lines of manufacturing become active.

New process for rust-proofing automobile bodies, by which each complete body assembled, instead of its separate panels, is treated just before the lacquer is applied, has been installed in the Graham-Paige body plant, at Detroit. This process, it is stated, not only provides a rust resisting protection, but also, by chemically changing the surface of the metal, insures a better bond between metal and the lacquer, an important factor in attaining permanence of body finish.

E. A. Roberts, of the **Roberts Brass Company** and **William C. Sherwood,** of the **Sherwood Brass Works,** Detroit, have been placed on an honor roll of those in various lines of business and industry who have supported the Detroit Board of Commerce for 20 years or more.

Jaeger Motor Car Company, Belleville, Mich., is a new unit in the industry. It has built and sold three cars, has orders on hand for 25 more, and plans to employ 30 additional workers to supplement the 17 already engaged. The company, of which **C. F. Jaeger** is the head and **H. H. Day,** general manager, plans to incorporate soon, it is announced, and establish branches in every state.

R. E. Olds, Lansing, Mich., automobile manufacturer, plans to enter the electric refrigeration field shortly. It is understood he has taken an option on the **Kold-Hold Company,** Greenfield, Mich., and may transfer its activities to Lansing and enlarging them.

J. D. Harris, chief engineer, **McCord Radiator and Manufacturing Company,** visions air conditioning today as similar to the early stages of the motor car industry. He maintains that success of air conditioning also depends on development and research. Commenting on the recent introduction of the convector cooling system by McCord, Mr. Harris said it is designed particularly for use in small offices, stores, banks and shops where floor space usually is at a premium and where it may be suspended from the ceiling or wall.

Eureka Vacuum Cleaner Company, Detroit, resumed production on November 1, with more orders on hand than can be filled in two months. **Fred Wardell,** president, says he is enthusiastic regarding the future. "For many weeks," he said, "we have been filling orders out of stock. Suddenly, about September 1, orders began to increase. Actual sales during September increased 32% over August."

So far as can be learned, plans of **Ford Motor Company** for next year are still in a formative stage. This organization is furnishing no information as what it intends to do in face of the more intense competition in the low-priced motor car field which is now developing. It is likely, it is stated, that the Ford V-eight will be relied upon to maintain the company's volume sales prestige. It is regarded as unlikely that Ford will bring out a six-cylinder model in the near future, in spite of rumors. The company is known, however, to have experimental sixes under laboratory tests.

Francis J. Conway, 32, president of the **Regent Stove Company,** died on Saturday, October 29. He was a graduate of the Staunton Military Academy and Georgetown University. He leaves a widow and two children.

E. J. Newell, 77, vice president, **Douglas and Lomason Company,** died at his home in Detroit, November 14. He was born in West Liberty, O., and came to Detroit more than 40 years ago. He was a thirty-second degree Mason. He is survived by his widow and two sons. F. J. H.

Toledo, Ohio

DECEMBER 1, 1932.

Manufacturing in this area has improved little within the last month. Nevertheless much optimism is expressed concerning the future. With the improvement anticipated in the Great Lakes industrial centers after the first of the year, Toledo should be among the first to experience a pick-up. This is not a one-industry city, and better things should develop here as soon as anywhere in the middle west.

Manufacturers of motor car accessories are planning for increased activity with perhaps definite schedules after January 1. Platers, although more or less inactive at present, also are planning for increased production after New Years. —F. J. H.

Wisconsin Notes

DECEMBER 1, 1932.

Revival of activity in the metal trades in Milwaukee is the result of an influx of orders from industries in widely varying lines of production. The recent monthly report of W. J. Fairbairn, secretary of the Milwaukee branch of the National Metal Trades Association, showed employment in 45 metal working shops increased 72 men during September over August, a small gain but the first in a year, and that the number of man hours worked per week rose from 29.4 in August to 30.7.

A decided pick-up is reported by **C. J. Zaiser**, president of **Ampco Metal, Inc.**, makers of acid resisting bronze. Ampco has been receiving orders from steel mills and western mines. Employment is steady.

Gordon Metals Corporation's business increased nearly 100% in September over August, according to **Lacy Crolius**, president. Orders have been small but numerous, he says, and come from nearly every industry except the automotive, which has been slow. Improvement in demand for pattern metal indicates larger industries are getting ready for expanded production, he said. Gordon Metals has shown increases every month over the month before, with one exception, since August, 1931.

National Enameling and Stamping Company reports good orders, with several large carload shipments resulting from new models brought out this season.

Geuder, Paeschke and Frey are said to be on near capacity schedules in some departments, with orders enough on books to continue at present rate until March. This company has added a number of employes and lengthened hours of some. The concern about a year ago added a complete line of gasoline station equipment, and several other new products to its line. B.

Los Angeles, Calif.

DECEMBER 1, 1932.

Crandall Machine Works, 2416 South San Pedro Street, is manufacturing vending machines and kindred equipment, using considerable nonferrous metal.

Central Machine and Manufacturing Company, 1401 South Los Angeles Street, has installed equipment for rapidly rolling threads on tubing, and a set of rotary punch presses with magazine feed.

S and M Lamp and Radiator Company, 118 West 36th Street, is making 15 types of automotive lamps, spot and road lights.

Stone Fog Light Corporation here is specializing in airport beacons, flood lights, fog penetrating lights, etc.

Harry Miller, South Grammercy Place, operates a plant producing racing autos, and has installed machinery to make nearly all required parts.

Adeomatic Company, 1155 South Hill Street, is making a new type of coffee maker. **H. H. Patrick** heads the firm.

Gillette Sweeper Corporation, 6916 Santa Monica Boulevard, is producing a new type carpet sweeper.

Washing Machine Service and Supply Company, 907 West 7th Place, is making parts for washing machines. Shops have also been established at Oakland, Calif., and Portland, Ore. **William Vogel** is head.

Sure Grip Company, 1090 South Broadway, is making a mason-jar opener of metal.

Royal Auto Products Company, Huntington Park, is making floor mats, using metal. **E. F. McClung** is general manager.

Meter Ice Company here has developed a machine which will dispense ice in 25 cent units, and has arranged with Frigidaire Corporation to take over the product. H. S.

Pacific Coast Notes

Schwayder Trunk Manufacturing Company, Denver, Colo., is reported to have installed equipment for making all kinds of trunk hardware. Plant covers two acres, and produces 750,000 pieces of luggage a year. Fully automatic conveyor systems are used.

Kiely-Mueller Company, New York, has opened an office in Tacoma, Wash., for sale of various metal devices.

Davis Engineering Corporation, New York and Elizabeth, N. J., has opened offices at Seattle, Wash., in charge of **Fred W. Carlson.**

Yates Machine Company, Beloit, Wis., has opened a San Francisco branch in charge of **H. E. Townsend**, formerly at Los Angeles but now in charge of all California sales.

Paramount Hardware Company, 340 Harriet Street, San Francisco, has been established by **Sidney A. Johnson**, assisted by **Oliver Lind, Harry Henderson** and **Thomas Doyle.**

E. I. Moore Company, 742 South San Pedro Street, Los Angeles, have been appointed western agents for the Wusthof Cutlery Company.

Mundell-Diggs Company, 364 14th Street, Oakland, Calif., is making a fountain type dishwashing machine. H. S.

Seattle, Washington

DECEMBER 1, 1932.

Officials of the **Doran Foundry Company**, 75 Horton Street, Seattle, report that November sales exceeded any month since June. One of the main products is propellers for coastwise vessels.

Eagle Brass Foundry Company, 21 Spokane Street, Seattle, has maintained part-time production operations at its large factory since January 1, according to word received by **William Anderson**, president. About 25 men are now employed.

Manufacture of two large copper cooling tanks with interior tubing for Fleischmann Yeast Company is only an item in the wide variety of specified orders received by **Alaska Copper Works**, Spokane Street and East Marginal Way, Seattle. The tanks are of unusual size, being 12 ft. in diameter and 13 ft. high. The firm's profits for September and October, 1932, showed a marked gain over 1931, **Morris Rosen** of the foundry declares. H. R. N. B.

Other Countries

Birmingham, England

NOVEMBER 21, 1932

Latest figures indicate progress is being made towards absorbing idle labor. In the Midlands division there is a drop of over 17,000 as compared with a year ago, but there are still nearly 250,000 wholly unemployed. Among the trades which have increased their volume of business are electroplating and jewelry. In electroplate factories there is more employment than there was twelve months ago. The Australian embargo against British goods has been lifted, and there is more prospect of Australian orders for electroplate and silverware. Export markets, however, are far from active.

According to the Birmingham Information Bureau, manufacture of metal powder boxes and other metal toilet requisites, previously almost a monopoly of Continental manufacturers is increasing in Birmingham. A number of firms have adopted the features of the best foreign products and are turning out work in every way equal to that previously imported. One company specializing in it, Fitzgerald Metalwares, Ltd., has doubled its output the past year, with consequent increase in staff. The jewelry trade is showing signs of improvement. In the imitation jewelry section this effect is more pronounced, and a number of Birmingham firms who are manufacturing gilt jewelry of a type previously imported are now exceptionally busy.

Price recovery is taking place slowly in the non-ferrous metal trade. More business is being put through although raw materials demand continues slow. The automotive trade is probably the biggest help to the non-ferrous industry. Certain departments of the electrical industry are also calling for quantities of metal of the lighter varieties.

National Aluminum Week held last month proved a success. Retailers reported considerable support from the public, and the promoters of the effort expressed themselves as satisfied.

Rumors are heard in regard to resumption of work on the giant new Cunarder in Scotland, suspended some months ago. No definite decision appears to have been made yet. It would provide work for thousands of men in factories. J. A. H.

Business Items —Verified

General Lead Batteries Company, 125 Chapel Street, Newark, N. J., storage battery maker, has increased schedules to full production basis. Company has a casting shop.

Universal Foundry Corporation, Oshkosh, Wis., has added complete equipment for producing brass and bronze commercial castings, in addition to its iron and aluminum facilities.

Hoosier Foundry Company, 1022 East Michigan Street, Indianapolis, Ind., manufacturers of iron and nonferrous castings, will establish an electroplating plant. **Edward Workman** is president.

S. Buchsbaum and Company, 159 North State Street, Chicago, Ill., manufacturing jewelers, has obtained from **Dirigold Company,** Kokomo, Ind., exclusive rights to manufacture certain merchandise made in dirigold alloy.

New officers of **The Diversey Corporation,** Chicago, Ill., detergent manufacturers, were recently elected by the directors, as follows: **Dr. E. B. Hutchins,** president; **Herbert W. Kochs,** vice-president; **Lewis Shere,** secretary. **W. D. Kennedy** remains treasurer.

Badger Brass Foundry Company, Milwaukee, Wis., has moved to better quarters at 1545 West Pierce Street, formerly occupied by Tremaine Machine Works. Company was formerly on West Vliet Street. It operates a complete non-ferrous foundry.

Sommer and Adams Company, Cleveland, Ohio, has appointed **Frank E. Artz,** 2136 North Newland Avenue, Chicago, Ill., district representative to handle its line of automatic polishing and buffing equipment, and machinery for continuous milling, drilling, etc.

B. F. Sturtevant Company, Hyde Park, Boston, Mass., is now owner of Cooling and Air Conditioning Corporation, of which it was formerly part owner. All manufacturing will be done at the Sturtevant plant. Among departments operated are plating and polishing.

American Smelting and Refining Company, New York, will form a new subsidiary to take over **Federated Metals Corporation,** New York, largest secondary metal and alloy refiner in United States. Federated stockholders on November 9 unanimously approved the deal.

McCray Refrigerator Company, Kendallville, Ind., sustained a loss of about $30,000 in a fire in its lumber sheds, October 15. Slight repairs have been made but no major rebuilding will be done now, according to **Ray E. Davis,** treasurer, as company is not handicapped as to production.

Worthington Pump and Machinery Corporation recently announced the appointment of **Hugh Benet** as manager of its Harrison, New Jersey, works. Since 1927, when Mr. Benet became associated with the Worthington organization, he has served as manager of the Holyoke, Mass., works.

Farrel-Birmingham Company, Inc., 344 Vulcan Street, Buffalo, N. Y., has appointed **E. J. von der Heide** sales representative to handle Farrel-Sykes gears, gear units and gear generators in the middle west. Mr. von der Heide's headquarters are at 824 Miami Savings Building, Dayton, Ohio.

Marble-Card Electric Company, Gladstone, Mich., has expanded its facilities and plans national distribution of its products, a line of a.c. and d.c. motors. **R. H. Garrison,** former general sales manager for Universal Motor Company, has been appointed vice-president in charge of merchandise. He states promotion will be carried on through advertising. Mr. Garrison is an electrical engineer, began his career with General Electric. He managed a specialty jobbing business, and distributed automobiles prior to his connection with Universal Motor Company.

Thomson-Gibb Electric Welding Company, with plants at Lynn, Massachusetts and Bay City, Michigan, announces a new department for manufacture of a complete line of wire mill and stranding machinery, including wire drawing machinery, pointers, takeup frames; planetary, rigid type and high speed strander for wire rope and electric cables; cable armoring and saturating equipment; steel, paper and rubberized taping machines and heads, electric brazing and welding machines designed for wire mill service. **A. R. Petterson,** formerly with the American Steel and Wire Company and also formerly chief engineer for the New England Wire Machinery Company will have charge of the sales and engineering work.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

Copper

DECEMBER 1, 1932.

Operations in the copper market were restricted in November. Prices, however, held distinctly steady for the most part, awaiting general trade upturn. There was an active European demand during the first half of the month which lifted the export price to 5.65c c.i.f. foreign ports. This figure compared with 5.17½c early in November. There was an absence of important business in the home market but while dealings for domestic account were restricted, the local position remained fairly steady on the basis of 5⅜c to 5½c delivered to Connecticut Valley points. Prices are now at near bottom for all time.

Zinc

There was a sudden demonstration of strength in the market for slab zinc around the middle of November. Early in the month transactions in Prime Western zinc took place on the basis of 3c East St. Louis. Improvement in the statistical position was recorded in the last monthly report. The ore situation also firmed up, with buyers absorbing a fair tonnage at advancing prices. A more optimistic outlook was created and demand and trading took on new life. Sales were made at 3.07½c Middle West delivery and later on a range of 3.15c to 3.20c. More recently, the market was quiet and the undertone slightly easier at 3.15c East St. Louis and 3.52c New York. Sellers were firm based on firm conditions in ore and steady decline in stocks of ore lately.

Tin

The market for tin opened quiet on the basis of 23.40c for prompt Straits tin. There were frequent changes in price which caused hesitation in buying. In the first half of November the price of Straits tin advanced to 24.20c. New interest in the market, however, was limited and within a comparatively short time supplies were available at 23.20c. Even at that the latter level buyers were not aggressive, although there was no significant pressure to sell. It was evident that traders here and abroad were awaiting developments.

Lead

Opening prices for pig lead were steady at 3c New York and 2.90c East St. Louis on a fairly active demand. Inquiry increased and trading developed on a larger scale. Buying was well diversified, and the business booked revealed purchases in good volume by leading consumers. On November 9 the New York price was advanced to 3.15c and the St. Louis basis to 3c. The latter quotations held until November 18 when there was a reduction of $3 a ton, or the equivalent of 3c New York and a decline of $2 a ton in the St. Louis price to 2.90c per pound. There was little disposition to buy heavily at the reduced prices.

Aluminum

Reports from the Middle West said increased automobile production in that district is boosting the consumption of aluminum and indications point to a continuing increase in consumption during the coming weeks. A stronger tone was also noted in the market for remelt aluminium.

Antimony

Trading in antimony has been exceptionally slow in the local market lately. Europe, however, has been a customer for

moderately large quantities recently for shipment from China. Asking prices consequently advanced to 5.90c to 6c, duty paid, for Chinese regulars. The firmer prices failed to bring about important domestic buying on a persistent scale, and the market eased off little by little until it is again on the basis of 5.75c New York, duty paid.

Quicksilver

The market for quicksilver has been quite active in recent weeks and the tone firmer. One of the chief features was the better domestic demand on the basis of $49 per flask. Imports in November were large for account of electrical manufacturers. Further large importations for electrical purposes have been arranged for with foreign producers.

Platinum

Demand for platinum is not attended by any new feature. Price of refined platinum is quoted at $30 per ounce.

Silver

Fluctuations in silver were within a narrow range. Heavy liquidation in speculative quarters took place in November. The decline in sterling exchange unsettled the bullion market abroad, and price here also lost ground. Buying by China and India is not sufficient to lift prices, and efforts for an international understanding do not appear to furnish strong hopes for a constructive policy regarding silver.

Old Metals

The position of the market for old metals reflects conditions existing in primary material.

The tendency in the lead and copper grades is easier in keeping with trade developments in the big markets. Local and western interests are watching intently for some constructive action by copper producers that will increase confidence and turn the tide for the better. Dealers find it hard to make a profitable turn in stock on present situation.

The Wrought Metal Business

By J. J. WHITEHEAD

President, Whitehead Metal Products Company of New York, Inc.

DECEMBER 1, 1932.

So far the falling off of business volume following the seasonal pick up has not cancelled all the gains made. Business is still better than it was before the fall upturn, and this is an encouraging sign.

If the next Congress will give some indication of co-operation and cohesion a lot of uncertainty will be removed and confidence further restored favoring further early improvement.

Again we have before us a world copper conference. What the result will be is problematical.

New markets are developing which may make use of a considerable metal in the not far distant future. The use of copper powder for bearings is making great headway, for instance. The Chrysler company uses about 85 such bearings with entire satisfaction. Other motor companies also use copper powder for this purpose. Besides bearings, it is possible to make a large variety of other pressed products by using not only copper but also zinc, lead, nickel, chromium, silver and other metals in the form of powder that is pressed to finished form.

The various companies making up the copper, brass, nickel and aluminum industries are marking time, along with general industry. When the pick-up comes it will be felt by every industry. Previous depressions have acted somewhat as the present one, and on this basis, when we get straightened around a little more, it is possible that the upturn will be more extensive than any of us anticipates.

Daily Metal Prices for November, 1932

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	7	8*	9	10	11	14	15	16	17
Copper c/lb. Duty Free													
Lake (Del.)	5.375	5.375	5.375	5.375	5.375	....	5.375	5.375	5.50	5.50	5.50	5.50	5.50
Electrolytic (Conn.)	5.25	5.25	5.25	5.25	5.25	....	5.25	5.25	5.375	5.375	5.375	5.375	5.375
Casting (f.o.b. ref.)	5.00	5.00	5.00	5.00	5.00	....	5.00	5.00	5.125	5.125	5.125	5.125	5.125
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.00	3.00	3.00	3.00	3.00	....	3.00	3.00	3.10	3.20	3.20	3.20	3.20
Brass Special	3.05	3.05	3.05	3.05	3.05	....	3.05	3.05	3.15	3.25	3.25	3.25	3.25
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	23.40	23.45	23.35	23.30	23.65	....	23.70	23.60	24.15	24.15	24.00	23.75	23.35
Pig 99%	22.30	22.35	22.25	22.20	22.55	....	22.60	22.50	23.00	23.00	22.875	22.65	22.25
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	2.90	2.90	2.90	2.90	2.90	....	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	....	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Electrolytic 99.9%	35	35	35	35	35	....	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	....	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	....	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	5.625	5.75	5.75	5.75	5.75	....	5.75	6.00	5.875	5.875	5.875	5.875	5.875
Silver c/oz. Troy Duty Free	27.125	27.00	27.00	27.00	27.375	....	27.25	27.00	27.00	27.00	27.00	27.00	26.875
Platinum $/oz. Troy Duty Free	30.00	30.00	30.00	30.00	30.00	....	30.00	30.00	30.00	30.00	30.00	30.00	30.00

	18	21	22	23	24*	25	28	29	30	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	5.50	5.50	5.50	5.50	....	5.50	5.375	5.375	5.375	5.50	5.375	5.438
Electrolytic (Conn.)	5.375	5.375	5.375	5.375	....	5.375	5.25	5.125	5.125	5.375	5.125	5.30
Casting (f.o.b. ref.)	5.125	5.125	5.125	5.125	....	5.125	5.00	5.00	5.00	5.125	5.00	5.063
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	3.15	3.15	3.15	3.15	....	3.15	3.15	3.125	3.125	3.20	3.00	3.102
Brass Special	3.20	3.20	3.20	3.20	....	3.20	3.20	3.175	3.175	3.25	3.05	3.152
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	23.45	23.35	23.20	23.05	....	22.60	22.40	22.00	22.50	24.15	22.00	23.32
Pig 99%	22.30	22.25	22.00	21.85	....	21.375	21.15	20.875	21.25	23.00	20.875	22.179
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	2.90	2.90	2.90	2.90	....	2.90	2.90	2.90	2.90	3.00	2.90	2.935
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	....	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Electrolytic 99.9%	35	35	35	35	....	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	....	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	....	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	5.875	5.80	5.80	5.75	....	5.75	5.75	5.75	5.75	6.00	5.625	5.799
Silver c/oz. Troy Duty Free	26.75	26.75	26.625	26.625	....	26.25	25.625	25.375	25.50	27.375	25.375	26.706
Platinum $/oz. Troy Duty Free	30.00	30.00	30.00	30.00	....	30.00	30.00	30.00	30.00	30.00	30.00	30.00

*Holiday.

Metal Prices, December 2, 1932

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 5.375. Electrolytic, 5.125. Casting, 5.00.
Zinc: Prime Western, 3.125. Brass Special, 3.175.
Tin: Straits, 22.45. Pig, 99%, 21.20.
Lead: 2.90. Aluminum, 23.30. Antimony, 5.50.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: Flash, 75 lbs., $49. **Bismuth,** 85.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** Troy oz., official price, N. Y., December 5, 25.125.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $30-$32.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	Duty
Brass Ingots, Yellow	4¾ to 6	45%
Brass Ingots, Red	6¼ to 7½	45%
Bronze Ingots	6¾ to 10	45%
Aluminum Casting Alloys	7 to 22	4c. lb.
Manganese Bronze Castings	18 to 35	45%
Manganese Bronze Ingots	6½ to 10	45%
Manganese Bronze Forgings	27 to 35	45%
Manganese Copper, 30%	18 to 25	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	7½ to 10	45%
Phosphor Copper, guaranteed 15%	10 to 16	3c. lb.
Phosphor Copper, guaranteed 10%	9¼ to 14½	3c. lb.
Phosphor Tin, no guarantee	30½ to 45	Free
Silicon Copper, 10%	18 to 30	45%
Iridium Platinum, 5%	$32.00	Free
Iridium Platinum, 10%	$33.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	3⅜ to 3⅝	Free
Light copper	2¾ to 3	Free
Heavy yellow brass	1¾ to 2	Free
Light brass	1¼ to 1½	Free
No. 1 composition	2⅝ to 2¾	Free
Composition turnings	2½ to 2⅝	Free
Heavy soft lead	2⅛ to 2¼	2½c. lb.
Old zinc	1⅝ to 1⅞	1½c. lb.
New zinc clips	1½ to 1¾	1½c. lb.
Aluminum clips (new, soft)	10¼ to 11¼	4c. lb.
Scrap aluminum, cast, mixed	3¾ to 4¼	4c. lb.
Scrap aluminum, sheet (old)	8 to 8½	4c. lb.
No. 1 pewter	12 to 12½	Free
Electrotype or stereotype	1¾ to 2	2½c. lb.*
Nickel anodes	22 to 24	10%
Nickel clips and turnings	17 to 25	10%
Monel scrap	5½ to 9	3c. lb.

* On lead content

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective since September 8, 1932.

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled	15⅜c.	2⅛c. lb.
Bare wire, soft	8c.	25%
Seamless tubing	14⅜c.	7c. lb.
Soldering coppers	15¾c.	45%

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

Net per lb.	High Brass	Low Brass	Bronze	Duty
Sheet	12½c.	13⅝c.	14c.	4c. lb.
Wire	12½c.	13⅝c.	14c.	25%
Rod	10¼c.	13⅝c.	14c.	4c. lb.
Open seam tubing	20½c.		22c.	25%
Angles, channels	20½c.		22c.	12c. lb.
Seamless tubing	15¼c.		16¾c.	8c. lb.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	21⅛c.	10% Quality	24c.
15% Quality	23¼c.	15% Quality	28⅛c.
18% Quality	24½c.	18% Quality	31⅝c.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound.	(Duty 4c. lb.)
Tobin Bronze Rod	14c.
Muntz or Yellow Metal Sheathing (14"x18")	14⅝c.
Muntz or Yellow Rectangular sheet other sheathing	14⅝c.
Muntz or Yellow Metal Rod	11¼c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (December 5) 28.50c. per Troy oz. upward according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00 to 10.25	2c. lb.
Full Lead Sheet (base price)	6.50	2½c. lb.
Cut Lead Sheet (base price)	6.75	2½c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs or over ..... 15c. above N. Y. pig tin price
100 to 500 lbs. ..... 17c. above N. Y. pig tin price
Up to 100 lbs. ..... 25c. above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, December 2, 1932

ANODES

Copper: Cast ..... 16¼c. per lb.
Rolled, sheets, trimmed ..... 14¼c. per lb.
Rolled, oval ..... 13½c. per lb.
Brass: Cast ..... 14½c. per lb.
Zinc: Cast ..... 08¾c. per lb.

Nickel: 90-92% ..... 41c. to 45c. per lb.
95-97% ..... 42c. to 46c. per lb.
99% cast, 44c. to 48c.; rolled, depolarized, 45c. to 49c.
Silver: Rolled silver anodes .999 fine were quoted December 5 from 28.50c., per Troy ounce upward, depending upon quantity.

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.85/lb.	$2.55/lb.	$2.35/lb.
10-12-14 & 16	2 to 3½	2.75	2.45	2.25
6-8 & over 16	1 to 2	2.95	2.65	2.45
6-8 & over 16	2 to 3½	2.90	2.60	2.35
6 to 24	Under ½	4.15	3.85	3.65
6 to 24	½ to 1	3.85	3.55	3.35
6 to 24	Over 3½	3.25	2.95	2.75

Any Quantity

4 to 6	Under ½, $4.90	½-1, $4.75	1 to 3, $4.65
1½ to 4	" 5.45	" 5.30	" 5.25
1 to ½	" 5.75	" 5.60	" 5.50

Extras: 25c. per lb. on wheels, 1 to 6 in. diam., over 3 in. thick.
On grey Mexican wheels deduct 10c. per lb. from above prices.

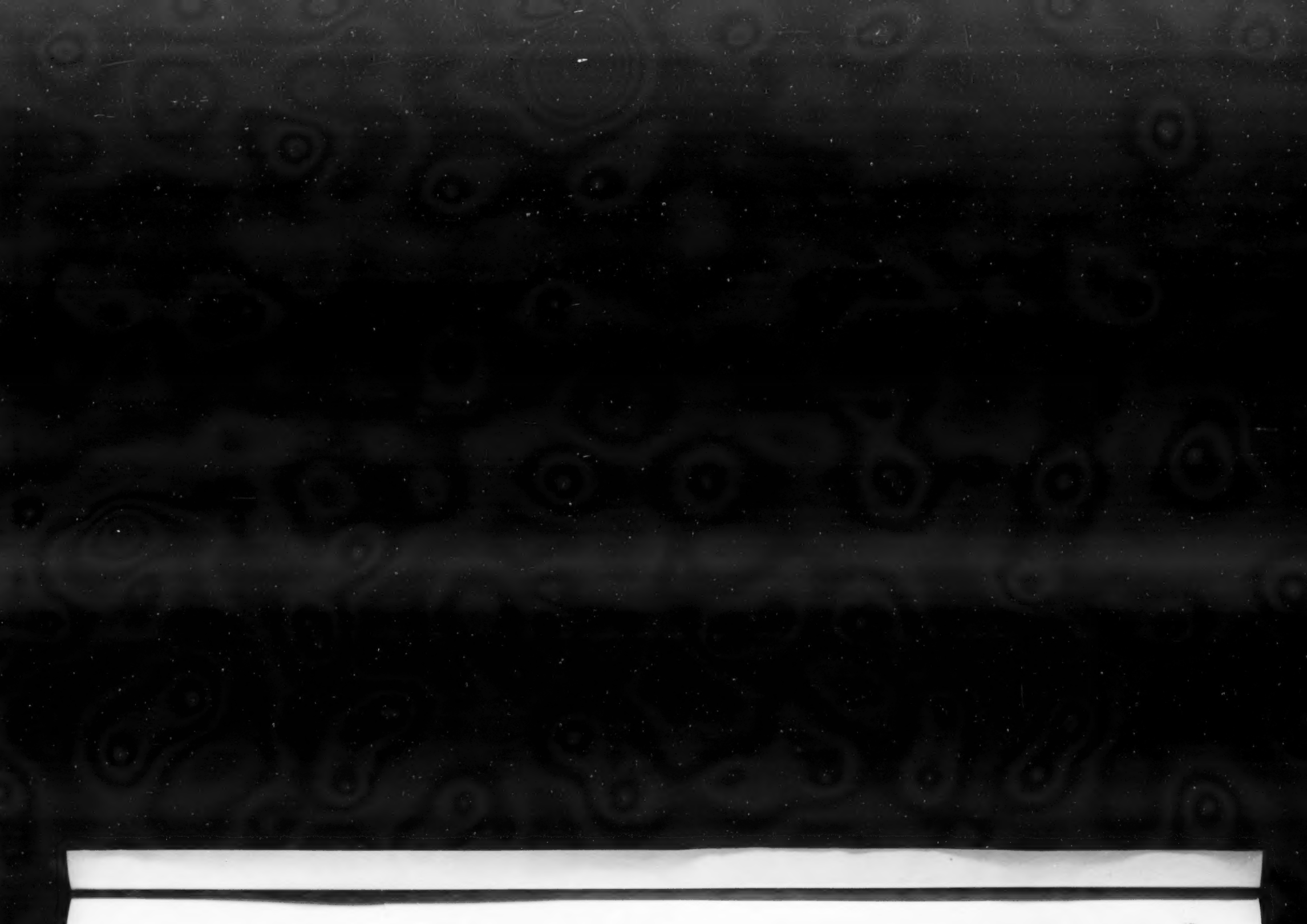
COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	$16.20 to 16.60
14" 20 ply 64/68 Unbleached	27.15 to 27.40
11" 20 ply 80/92 Unbleached	18.55 to 18.70
14" 20 ply 80/92 Unbleached	31.10
11" 20 ply 84/92 Unbleached	24.05 to 25.05
14" 20 ply 84/92 Unbleached	39.90 to 41.95

Sewed Pieced Buffs, per lb., bleached ..... 30c to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 75 to 400 lb. drums	lb.	.12 -.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08-.12
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	11.30-18.00
Denatured drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, 26 deg., drums, carboys	lb.	.02¾-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.12
Chrome Green, bbls.	lb.	.19
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.20
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	2.75-5.25
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluorspar, bags	lb.	.04½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead—Acetate (Sugar of Lead)	lb.	.09-.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.16-.21
Salts, single, 300 lb. bbls.	lb.	.11-.13
Salts, double, 425 lb. bbls.	lb.	.11-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium—Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.06⅝
Cyanide, 165 lbs. cases, 94-96%	lb.	.50
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.05½
Silver—Chloride, dry, 100 oz. lots	oz.	.24½-.27½
Cyanide (fluctuating)	oz.	.31¾-.37½
Nitrate, 100 ounce lots	oz.	.20¼-.23¾
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Beryllium fluoride ($2NaF.BeF_2$)	lb.	4.30-7.00
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate	lb.	.05 -.06¼
Nitrate, tech., bbls.	lb.	.03¼-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate, fluctuating	lb.	.22
Sulphocyanide	lb.	.30 -.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, fluctuating, 100 lb. kegs	lb.	.25-.25½
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½